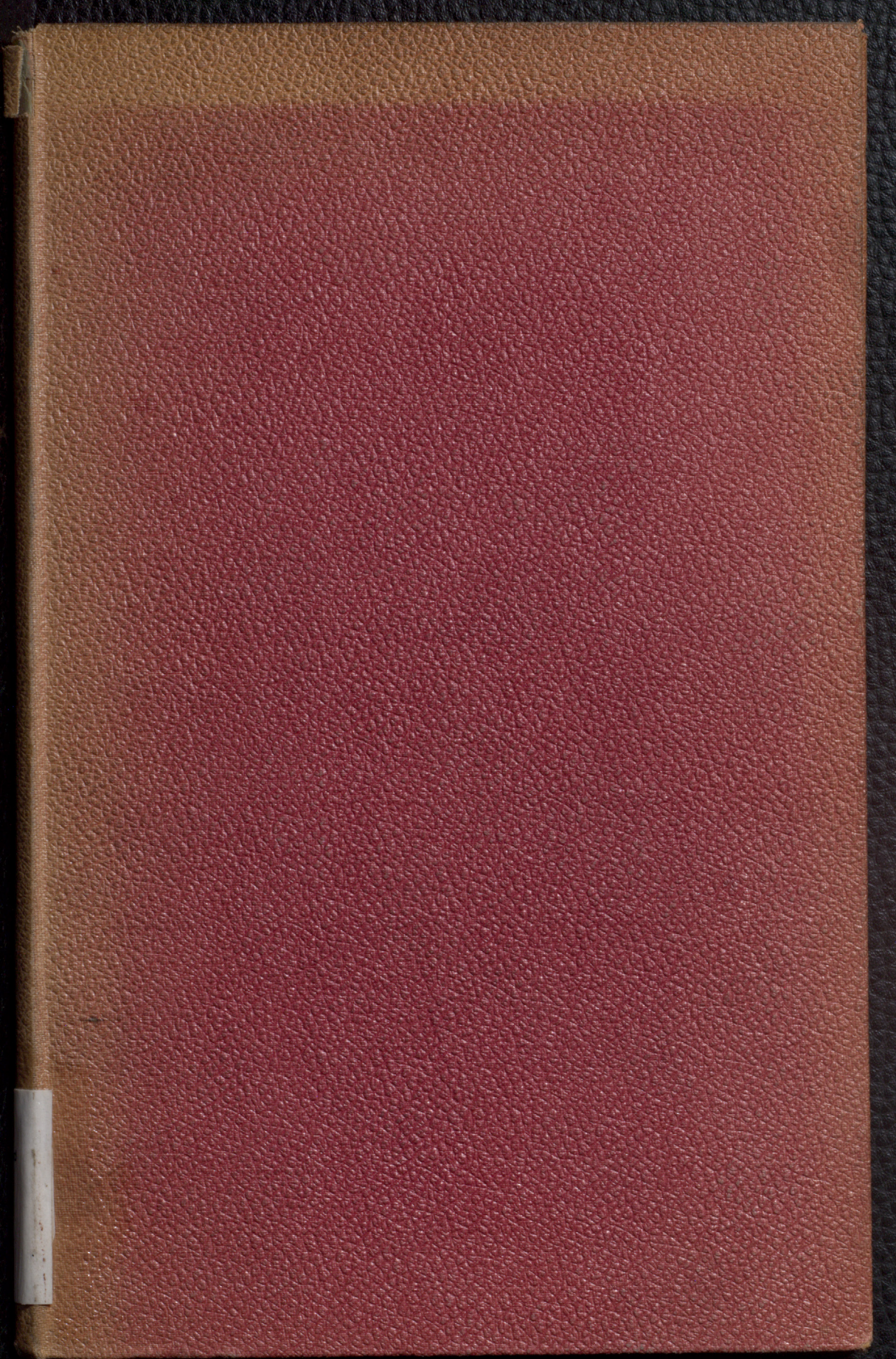


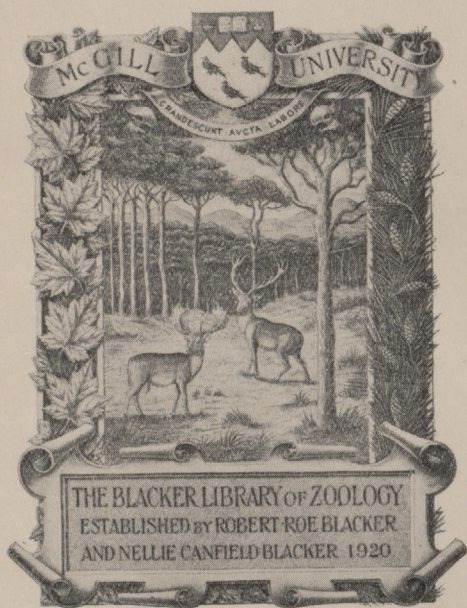


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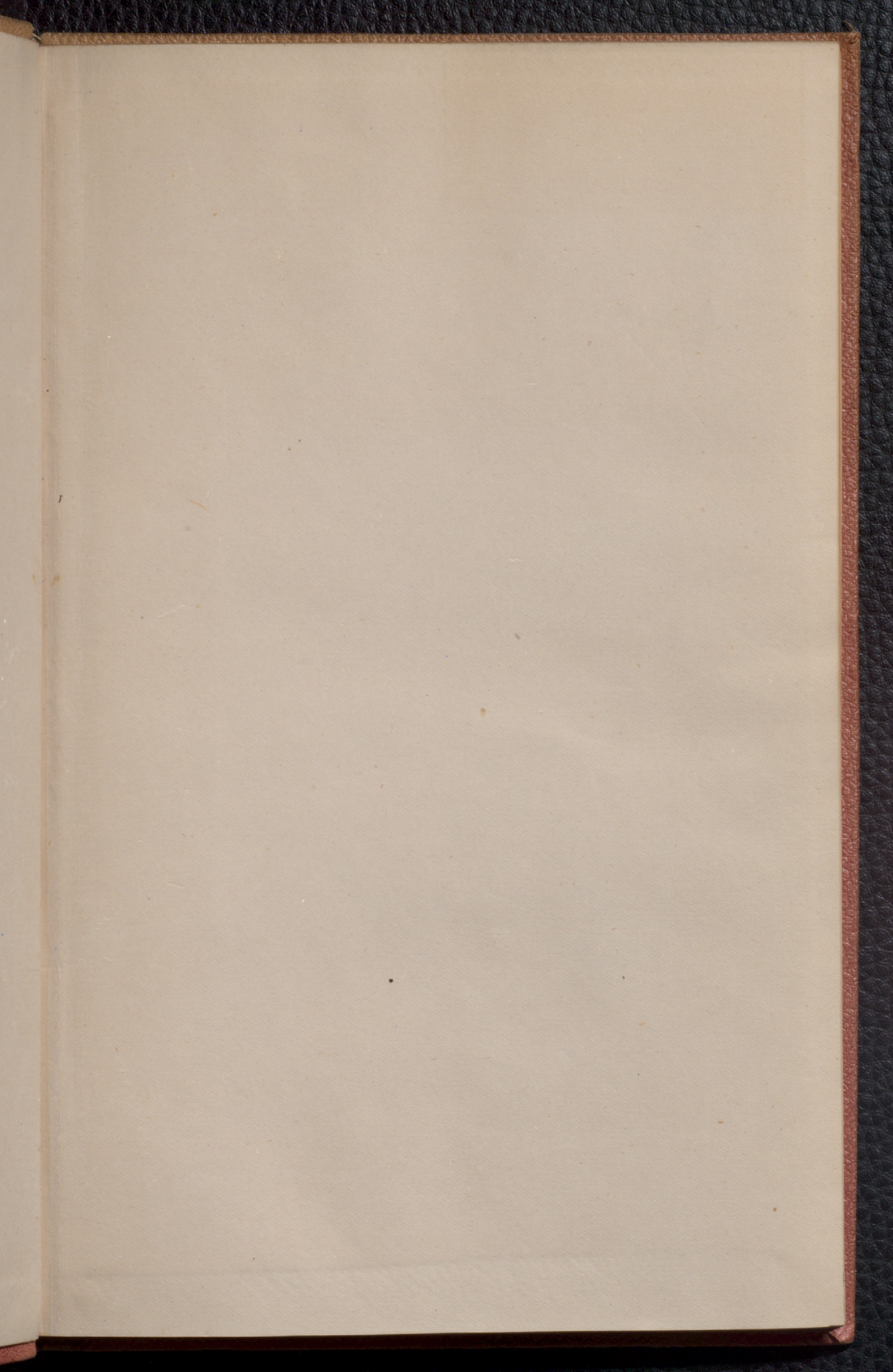
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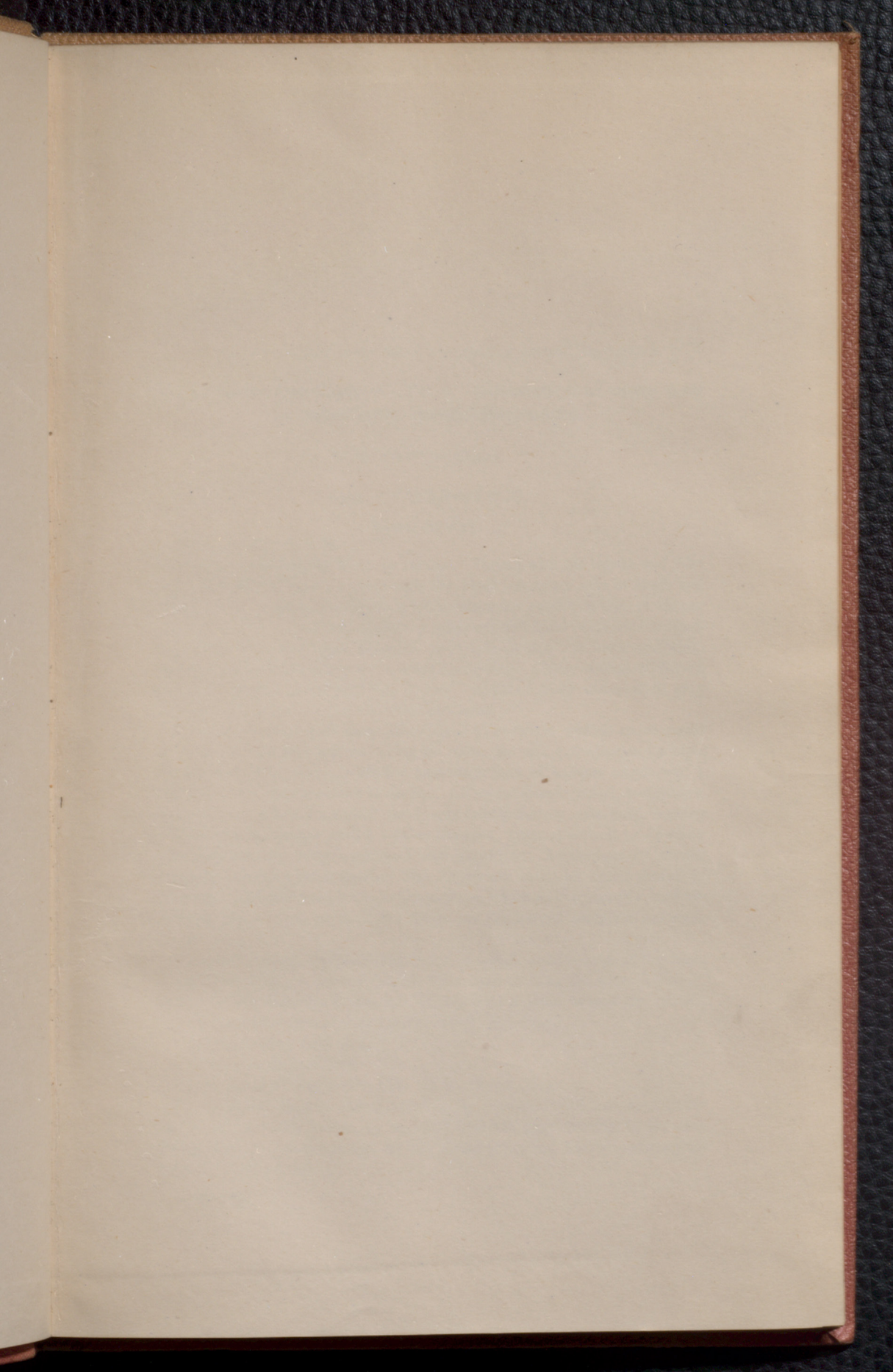
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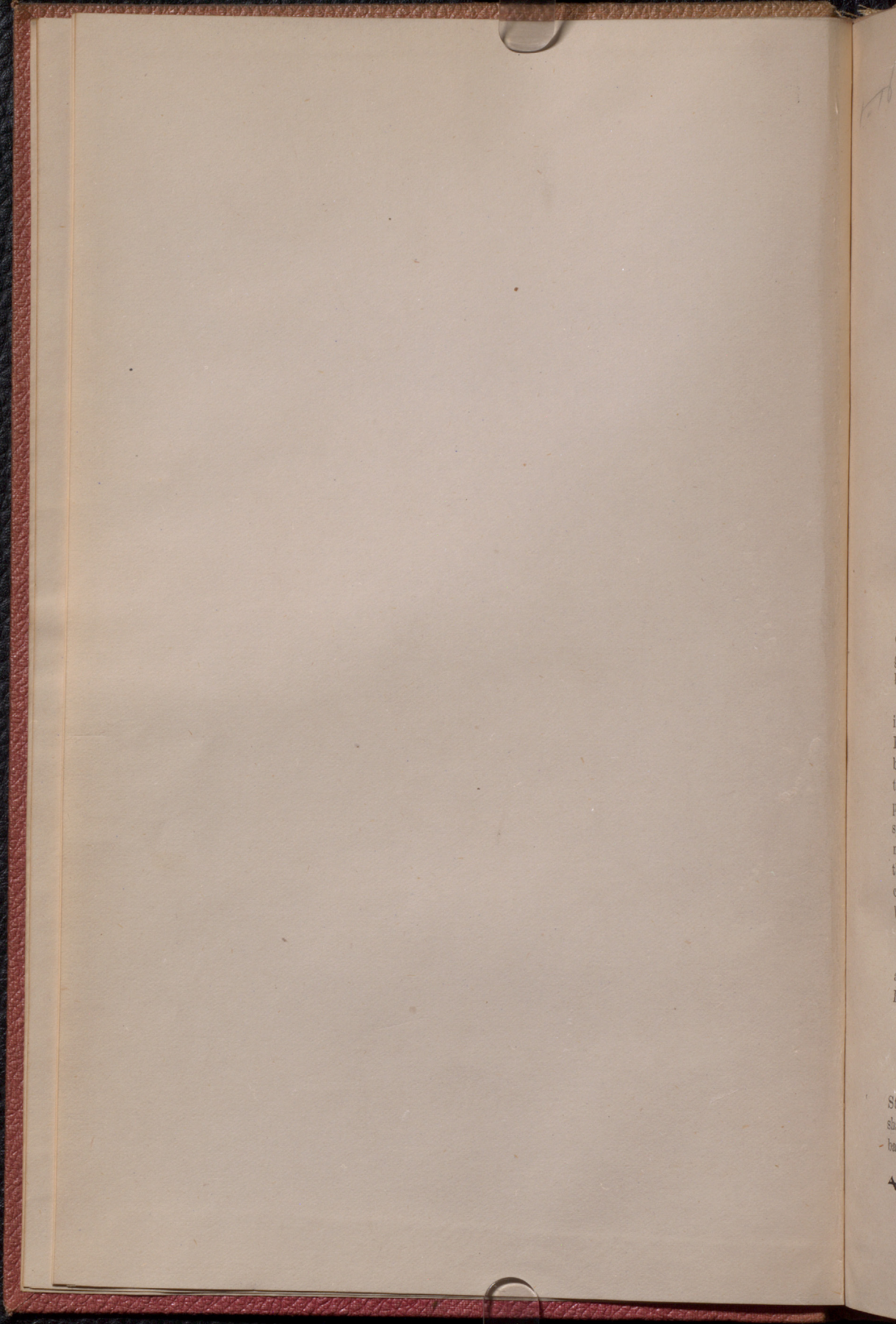
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[From the Proceedings of the California Academy of Sciences, July 7, 1873.]—78

**Pacific Coast Lepidoptera.—No. 1. Description of some new
or imperfectly known Heterocera.**

BY HENRY EDWARDS.

Fam. SPHINGIDÆ.

Genus SPHINX.

Sphinx perelegans, n. sp.

Head pale, silvery gray, black on occiput. Thorax with the tegulæ and sides gray; disc velvety black, uniting with the black on upper side of head, and forming, when viewed from above, a long, triangular patch; centre of thorax gray at the base. Abdomen dark gray, sprinked with black, with narrow black dorsal line. The five basal segments are equally divided into black and white demi-bands, the black being very intense and glossy. Under surface of thorax gray, with central interrupted black line. Antennæ white above, dark gray beneath. Tibiæ grayish brown, with tarsi paler.

Primaries, fuscous with many paler waved lines, and a whitish space reaching from the base over half-way along the costa, but not extending to its edge. Resting upon this pale space are five bent black lines of unequal length, and a bent line at the apex reaching to the tip. Along the margin, from internal angle to apex, is a pale submarginal band, very faintly dentate externally, running parallel with the margin until it reaches the apex, where it spreads into a wider space, receiving the before-mentioned bent apical line. At the base of interior margin is a clouded black patch. The fringes are brownish black, dotted on their edges with six conspicuous white patches, which do not, however, entirely cross the fringe. The whole of the fringe on the interior margin is brownish black.

Secondaries, black, with brownish tinge; a broad, whitish band at the base, widest posteriorly; a narrow grayish-white band crossing the wing obliquely, almost parallel with the margin, but slightly bent a little behind the middle. Fringes white, intersected with brown. (Coll. Hy. Edw.)

Expanse of wing, 3.64 inch.

Length of body, 1.52 inch.

Gilroy, Santa Clara County, Cal. G. R. Crotch, Esq.

This beautiful specimen closely resembles *Sp. eremitus*, Walk., of the Atlantic States, but is readily known by its more brilliant gray coloring, by the very sharply defined demi-bands, and by the strongly marked whitish submarginal band of the fore-wings.

43575

Sphinx oreodaphne, n. sp.

Head wanting in my specimen.

Thorax pale, ashy gray, slightly sprinkled with black hairs, and with a well-defined triangular black mark, the vertex of which rests on the prothorax, its sides reaching to and joining the basal black demi-band of the abdomen. The area inclosed by the triangle is pale gray. Abdomen, above, gray sprinkled with black, with narrow black dorsal line, and seven demi-bands of rich velvety black, the basal one becoming almost circular in form, and uniting with the triangular mark on the thorax. Thorax and abdomen, beneath wholly pale gray, as also are the legs, the tarsi being very faintly sprinkled with black.

Primaries, wholly pale gray, with narrow black longitudinal lines, only slightly bent, the two largest resting on the centre of the median nerve. Along the posterior margin is a whitish, irregular, submarginal band, not reaching to the internal angle.

Secondaries, blackish fuscous, with two undulating whitish bands, the outer one not quite reaching to the apex. Fringes of primaries brownish, sprinkled with gray; those of the secondaries white, very indistinctly mottled with brown. (Coll. Hy. Edw.)

Expanse of wings, 3.40 inch.

Length of body, 1.50 inch.

Taken on the wing, about flowers of California Laurel (*Oreodaphne Californica*), near St. Helena, Napa County, in June, 1872. A strongly marked species, readily distinguished by its pale fore-wings, and by the triangular mark of the thorax. The head was, unfortunately, broken from my unique specimen before it reached my hands.

Sphinx Sequoia, Boisduval, Lepid. Calif., 1869.

Head and thorax light gray, sprinkled with black, with two indistinct black lines on the occiput, reaching to prothorax, and thence spreading toward the sides of the tegulae. Abdomen gray, with black dorsal line. The segments are whitish at their base, the five posterior with a black sub-linear patch on their outer edges. Antennae white above, gray beneath. Feet wholly gray, spotted with black.

Primaries, gray, indistinctly dotted with black, with four or five very faint black lines the longest near the apex. Fringes grayish brown, intersected with white.

Secondaries, grayish fuscous, entirely without bands. The fringes are white intersected with brown, except toward anal angle, where they are wholly whitish.

Expanse of wings, 2 inches.

Length of body, 1 inch.

(Coll. Bois., Hy. Edw.)

Grass Valley, M. Lorquin. Bear Valley, Sier. Nevada, H. E.

I had the good fortune to take a fine ♂ of this rare species in Bear Valley, in

June, 1872. It was hovering at mid-day over a pool of water, darting down occasionally to drink. The specimen from which Dr. Boisduval made his description was captured by the late M. Lorquin, at Grass Valley, resting on the bark of a Redwood tree, (*Sequoia sempervirens*—Lamb.)

Sphinx Vancouverensis, n. sp.

Head dull gray, brownish on the occiput, and sprinkled with brown hairs. Eyes dull black, surrounded by a blackish ring of hairs. Tegulae wholly cinereous. Abdomen blackish gray, with narrow black dorsal line, and six rather broad demi-bands of dirty white, blackish on the posterior margins of segments. Thorax and abdomen, beneath dull brownish gray.

Primaries, fuscous, with a grayish space running from base to about half way along the middle of wing, and an irregular submarginal band from internal angle to apex, the outer edge of which is deeply dentate. Near the median nerve are three straight black dashes, and a bent one toward the apex. Fringes brown, sprinkled with gray.

Secondaries, fuscous, with two dull whitish bands, slightly waved, the outer one parallel with the margin of the wing for three-fourths of its distance.

Expanse of wing, 3.55 inch.

Length of body, 1.50 inch.

Esquimault, Vancouver Island. (1 ♂ Coll. Hy. Edw.)

Taken in August, 1871, by Dr. Bremner, of H. M. S. Zealous.

Fam. ZYGÆNIDÆ.

PSEUDALYPIA, nov. gen.

Head small, front very long, densely pilose. Clypeus very long, smooth, triangular, notched on each side in front, and, when viewed from above, concealing the palpi, which are short, pilose, the third joint longest, the whole palpus straight, and shorter than the head. Antennae simple, not thickened as in *Alypia*. Eyes small, not prominent. Tongue more than half as long as the body. Thorax pilose, the hairs of patagia especially long. Abdomen short, stout, covered with close, glossy pubescence. Abdominal tuft long. Wings short and broad.

Primaries, with apical angle much rounded. The nervules are very thick; venation similar to *Alypia*.

Secondaries ample, very much rounded, especially toward the anal angle. Fringes of both wings very long. Legs long, only slightly pilose, wanting the bunches of hair observable in *Alypia*; hind pair with two very nearly equal pairs of spines, terminal pair very slightly the shorter.

This genus differs from its near ally, *Alypia*, by the longer tongue, shorter palpi, stouter and more glossy abdomen, simple antennae, and by the absence of the dense tufts of hair on the fore tibiae. The system of coloration is also essentially different; as in *Alypia* it consists of a series of spots variously

arranged, while in the present genus it forms a simple band, crossing the forewings near the middle.

Pseudalypia Crotchii, n. sp.

Head, thorax, patagia, and abdomen, deep glossy black, with a slight bronze tinge. Collar, base of palpi, and abdominal tuft, golden orange. Antennae glossy black, with short scales. Palpi, black above, golden orange beneath. Feet wholly black, with some small white patches arranged in circular form on the hind tarsi.

Primaries, glossy black, with a greenish metallic tinge. The costa, for about three fourths of its length, and a narrow, slightly curved band crossing the wing beyond the middle, cream white. Apical edge of fringe white, the remainder glossy black.

Secondaries, dull black, with a slight brownish hue. Fringe cream white, except toward the anal angle, where it is black. Under side similar to the upper, with the band of primaries more broadly defined, and with a whitish tinge toward their base. (2 ♀ Coll. Hy. Edw.)

Expanse of wings, 0.85 inch.

Length of body, 0.35 inch.

Warner's Ranch, San Diego, Cal., May 8, 1873.

This exquisite insect was discovered by my friend, Mr. G. R. Crotch, whose enthusiastic labors have added so much to our knowledge of the insect fauna of California, and to whom I regardfully dedicate the species. It was flying in the heat of the day, alighting frequently on flowers, and manifesting much the same habits as the various species of *Alypia*.

Genus *CTEUNCHA*. Kirby.

Ctenucha Walsinghamii, n. sp.

Size and aspect of *C. multifaria*.

Head, collar and patagia bright crimson, the latter narrowly edged with black, as in *C. multifaria*; palpi also crimson, with the terminal article black. Antennae long, bluish black, closely bipectinate. Thorax with the disc greenish black. Abdomen very glossy, bluish black, with a faint greenish tinge. Legs bluish black, with the anterior coxae distinctly white. Fore tibiae with a few white scales.

Primaries, bluish black, with a greenish tinge, most vivid toward the base. Costal edge entirely dull black. Fringe white at apices, the remainder black.

Secondaries, bluish black, with a purple tinge. Fringe white at apices, rest entirely black.

Expanse of wings, 1.90 inch.

Length of body, 0.60 inch.

Fort Crook, Oregon, June, 1872. (1 ♂ Coll. Hy. Edw.)

I owe the possession of this beautiful specimen to Lord Walsingham, who found it in the above locality during his recent tour through Southern Oregon

where it appears to be very rare. At first sight, this species may be confounded with *C. multifaria*, but differs in having the costa entirely black, and the apices of the wings *only* with white fringe.

Fam. EPIADIDÆ.

Genus EPIALUS. H. G.

Epialus modestus, n. sp.

Head, thorax, and abdomen dull fawn color; thorax with rather long hairs. Eyes black. Feet chestnut, with long hairs.

Primaries, wholly fawn colored; scales thinly scattered over the surface, a few of them having a reddish tinge.

Secondaries, pale fuscous, fawn color at the base.

Expanse of wings, 0.60 inch.

Length of body, 0.28 inch.

(1 ♂ Coll. Hy. Edw.) San Miguel, Cal., April, 1873.

The smallest species of the genus yet known to me. It was taken at rest in the flowers of *Compositæ*.

LIST OF SPECIES.

- Sphinx perelegans*, n. sp. Gilroy, California.
 " *Oreodaphne*, n. sp. S. Helena, California.
 " *Vancouverensis*, n. sp. Esquimault, Vancouver Island.
 " *Sequoiæ*, Bois. Bear Valley, California.
Pseudalypia (n. gen.) *Crotchii*, n. sp. Warner's Ranch, California;
Ctenucha Walsinghamii, n. sp. Fort Crook, Oregon.
Epialus modestus, n. sp. San Miguel, California.

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[From the Proceedings of the California Academy of Sciences, October 6th, 1873.]

**Pacific Coast Lepidoptera.—No. 2. On the Transformation of
the Diurnal Lepidoptera of California and the
adjacent Districts.**

BY HENRY EDWARDS.

In the hope of calling the attention of observers to the earlier stages of our butterflies, I have compiled from my own researches and from the best published material at my command, descriptions of all the larvæ and chrysalides of species belonging to the Pacific Coast, with which entomologists are at present acquainted. It is to be regretted that the list is so small, and that so little attention has hitherto been given to this interesting branch of study; out of 200 species of diurnal Lepidoptera inhabiting the Coast, only about 20 being known in the larval condition, and these being for the most part very briefly and imperfectly described. Thus, no species of either *Pieris*, *Anthocaris*, *Argynnis*, *Thecla*, *Lycæna*, *Satyrus*, or of any of the numerous forms of the *Hesperida*, has yet been noticed in its earlier stages, and the caterpillar of our common swallow-tailed butterfly (*Papilio Rutulus*), so abundant in every cañon during the spring and summer, is as yet unregistered and undescribed. The importance of these earlier conditions of insect life, in the discrimination of closely allied species, cannot be over-estimated, and it will be seen from the poverty of our present knowledge how large a field of interesting observation is open to the entomological student. The subjoined descriptions have been, in most cases, drawn up by myself from personal investigation of each species; but in one or two instances I have availed myself of the labor of others, for which due credit has always been given. A few species, such as *Vanessa californica*, *Pyrameis caryæ*, *Thecla californica*, and *Thecla iriviles*, are well known to me, but I must defer their descriptions until some future day, as my notes upon these species have been mislaid or lost. In the Eastern States, the transformations of *Pieris protodice* and *Colias coesonia* are well known, though I cannot find any published description of either of them; while my friend Mr. T. L. Mead of New York was fortunate enough to raise the larvæ of *Pieris*

occidentalis and *Anthocaris ausoniedes*, descriptions of both of which species will shortly appear from the pen of Mr. W. H. Edwards of West Virginia, in his exquisite work on the Butterflies of North America. In the mean time, I respectfully ask the co-operation of all persons on this Coast, who are interested in the study of entomology, towards a better understanding of the transformations of these beautiful denizens of our woods and fields, assuring them that I will cheerfully credit them with any information they may supply to me.

The following species are noticed in the present paper :

<i>Papilio Philenor</i> , Larva and chrys.	<i>Melitæa palla</i> , Larva and Chrys.
“ <i>Zolicaon</i> , “ “	<i>Phyciodes mylitta</i> , “ “
“ <i>Asterias</i> , “ “	<i>Grapta satyrus</i> , “ “
“ <i>Eurymedon</i> , “ “	“ <i>zephyrus</i> , “ “
“ <i>Rutulus</i> , Chrysalis.	<i>Vanessa antiopa</i> , “ “
<i>Neophasia menapia</i> , “	“ <i>Milberti</i> , “ “
<i>Colias enrythema</i> , Larva and Chrys.	<i>Pyrameis Huntera</i> , “ “
<i>Terias nicippe</i> , “ “	“ <i>Cardui</i> , “ “
<i>Danaïs Archippus</i> , “ “	“ <i>Atalanta</i> , “ “
<i>Melitæa chalcodon</i> , “ “	<i>Junonia coenia</i> , “ “
“ <i>Editha</i> , “ “	<i>Limenitis Lorquini</i> , Chrysalis.
<i>Limenitis Californica</i> , Chrysalis.	

Papilio Philenor. Fabr.

Larva. Head blackish brown. Body very dark brown, slightly shining, with two dorsal rows of long, fleshy processes, those near the anal extremity being the longest, bright orange red. A lateral row of processes, brown, reddish at base; those anteriorly being the longest. On the first segment are three orange red blotches, arranged almost in the form of a triangle. Spiracles orange red. Feet brown-black, red at their base. Under side dull flesh color. Retractable tentacles, bright orange.

Length, 2 inches. Width, 0.25 inch.

Food plant, *Aristolochia serpentaria*.

Chrysalis. Rather short, extremely broad in the middle, stone color, with a slight violet tinge. Truncate in front, with a very high protuberance on the thoracic region, two smaller ones on its sides, directed towards the head, and a double row of short dorsal protuberances toward the posterior region of the abdomen. Scattered over the upper surface are some pale, golden yellow patches.

There are two broods of this species; the first appearing toward the end of May, and the latter in August. From eight specimens of larvæ obtained at Saucelito, near this city, in April of the present year, I have had the following results :

Changed to chrysalis, May 11th-24th.

Imagos appeared, June 4th-14th.

3 ♂. 3 ♀. Two specimens are now alive in the chrysalis state, and will probably make their appearance early in the coming spring. The species is

remarkably common on Angel Island, near Saucelito, and throughout Napa and Sonoma Counties.

Papilio Zolicaon. Bdv.

Larva. Head pale bluish green, yellowish in front; eyes black with two black stripes in front, between each of which is a small black spot. General color of entire upper surface, pale, but very bright apple-green; slightly paler on the sides. First segment with one transverse black band and the suture black, with two small yellow points on each side before the anterior band, plate above the horn dusky. Second segment, with broad transverse black band, broadest on the back, with four anterior scallops, and a small yellow dot in each scallop, a long, transverse, lateral spot, yellow at the top. Third segment similar to second, except that the yellow spots on the transverse band are larger. Segments four and five, with transverse black band broken on each side by three yellow spots, below which is a rounded black spot. Segments six to nine inclusive, same as four and five, except that instead of the subventral round black spot there are two near the edges of the segments, with a third on the outside of each leg. Segments ten and eleven same as four and five. Segment twelve with a black anterior transverse line, with two yellow spots on the anterior margin, two rounded black dorsal spots, a posterior band, and a long black lateral spot over the anal feet. Prolegs pale bluish, black at tips, with black spot at the base of each. Anal feet dusky. Beneath pale bluish green, with broken median line of dusky marks, most prominent on the leg-bearing segments.

Length, 2.00 inches. Body tapering each way from the fourth segment, when seen from above. Viewed sidewise, the three anterior segments taper toward the head. I owe the above description to my friend Mr. R. H. Stretch, who has made an admirable figure of the larva. I find, however, that the insect is very liable to variations in its larval state; the transverse bands in many specimens becoming very broad, and the yellow spots obsolete in some of the segments, while in others the whole upper surface is pale green, with very faint black bands, and the yellow markings considerably larger. The above form may, however, be taken as the type.

Food plants. Various species of *Umbelliferae*, but particularly *Faniculum vulgare*. In confinement, the caterpillars will feed readily upon the common carrot of the gardens. There appears to be but one brood of this species, the larvæ being fully fed about the middle of September, and the imago appearing in the following May.

Chrysalis. Fawn color, shading into blackish brown at the sides and dorsal region, and mottled irregularly underneath with the same color. Head deeply notched in front, thus forming two protuberances on the sides in front, these being very rough, and intensely black in color. Thorax also with black dorsal protuberance, and a lesser one on the sides. On the fifth, sixth, seventh, and eighth segments are two small, black points, convergent toward the anal extremity. The chrysalis, like the larva, is subject to great variations, some speci-

mens being almost wholly black, with shadings of fawn color, while others lose the black altogether, and are fawn color, with pale brown markings.

Papilio Asterias. Fab.

"*Larva.* Apple green, with a transverse band on each segment, formed of alternate bands of black and yellow, excepting on the first three, where the black band is interrupted by the yellow points only toward the spiracles; whilst on the back, the yellow points are placed before the black band; three black points on the anterior part of the first segment, and two black lines on the head. The feet have black points at their base.—Feeds on *Daucus carota*, *Anethum feniculum*, and other umbelliferous plants."—BOISDUVAL.

Chrysalis. Very similar in size and shape to that of *P. Zolicaon*, but differing in its lighter color, and the absence of the dark shading on the dorsal and lateral regions.

The perfect insect has occurred in Marin County, and a fine specimen was taken some years ago near Oakland by Mr. Jas. Behrens; so that the larva may be sought for in these localities.

Papilio Eurymedon. Boisd.

Larva. Head pale brown, with a fleshy tinge. Entire upper surface of body pale apple green, with the following markings. The first segment has its anterior margin broadly yellow. The third segment is much thickened, with its posterior margin broadly yellow, surmounted by a row of small black dots, and in front with a series of about six irregular yellow patches, edged with black, enclosing a black spot with a yellow centre. Between the third and fourth segments is a broad black band, which is concealed by the margins of the segments at the will of the insect. On the fifth and sixth segments are two blackish dots, and on the seventh, eighth, and ninth are four black or purplish dots. Feet, prolegs, and entire under surface, greenish white. Body tapering very much posteriorly from the third segment. Retractable horns bright orange. When irritated, the insect draws in its head, folding it almost so as to be concealed by the first segment, and swelling out the third in front, it presents a most grotesque appearance: the horns being protruded, and the curious yellow markings, which have some resemblance in form to a pair of spectacles, representing eyes. It must under these circumstances be a very formidable looking monster to its insect enemies.

Food plant, *Frangula californica*.

Chrysa'is. Long, tapering very much toward the anal extremity, which is very sharply pointed. Color, pale fawn color, with dashes of black and brown very irregularly scattered over the entire surface, a little more intense and connected at the sides. The protuberances of the head and thorax are brown, mottled with dirty white, and the seventh, eighth, and ninth segments have each two raised black dots. The spiracles, which are distinctly seen, are dark brown. The under side is marked with dashes of brown and black, irregularly

placed. In some individuals, the ground color of the chrysalis is very pale green. Larvæ found in August changed to chrysalis in September, and the perfect insects appeared in the following Spring, one specimen emerging as early as the 23d of February.

Papilio Rutulus. Bois.

I regret that at present I can say nothing with certainty respecting the larva of this very common species, but it is reasonable to expect that our ignorance of its transformations cannot long continue.

Chrysalis. Remarkably like that of *Eurymedon*. The markings are, however, certainly more regularly disposed, and assume the form of stripes and rows of spots and lines. On the seventh, eighth, and ninth segments also, the raised black dots are distinctly larger, and a double row of them is invariably plainly visible. I remark this character in five specimens of the chrysalis which I have found, all of which have produced the true typical *P. Rutulus*. Beyond the more regular arrangement of the markings, and the presence of two black, raised dots on the segments referred to, I can discern no difference in the chrysalis state of *P. Rutulus* and *P. Eurymedon*.

Neophasia menapia. Felder.

Larva, ignota.

Chrysalis. Very long and tubular, with the beak sharply pointed, slightly thickened toward base of abdomen. A small ridge-like protuberance on the thorax, and a smaller one near the head. Color immediately after change, pale yellowish green, with three narrow dorsal stripes, silvery white. The lateral stripes enclosing the stigmata, are a little broader, and bent upward anteriorly. Stigmata brownish. The neuration of the wings is plainly seen, and at their base is a well-defined black spot. Toward the period of emergence, the chrysalis loses its bright green color, and becomes of a dark olive hue, almost black above, the silvery tone of the stripes changing to dirty white, the coloration of the wings and various organs being more distinctly seen. The chrysalis is attached to the trunks of pine and fir trees, with the head invariably directed upward, and to the fronds of *Pteris*, with the head always toward the point of the frond.

Length, 0.80 inch. Width, 0.15 inch.

I was fortunate enough to discover the chrysalis of this highly interesting species during a recent trip to Vancouver Island, but the most diligent search did not reward me with the caterpillar. It doubtless feeds upon the Douglas spruce fir (*Abies Douglassii*), and should be sought for in the early part of July.

Colias eurytheme. Bois.

With reference to this species, I extract the following from Mr. W. H. Edwards' "Butterflies of North America."

"*Colias Eurytheme*. From Mr. Hayhurst I have received an admirably executed drawing of the egg, larva and chrysalis of this species. The egg is long, fusiform, and ribbed longitudinally. Length of mature larva, 1.4 inch; cylindrical, tapering posteriorly from eleventh segment; head green, translucent, body dark green, somewhat pilose, each segment transversely creased; a narrow, white, lateral band, from second to last segment, through the middle of which runs a broken line of vermillion red. The larva is a little longer and larger than that of *C. Philodice*, which it much resembles, but is without the series of semicircular black spots next under the lateral band, usually seen on the latter. The eggs were deposited on Buffalo grass (*Trifolium reflexum*), and the larvæ fed thereon. Chrysalis .95 inch in length, cylindrical, tapering to a point posteriorly; the head case also produced to a point; mesonotal process rounded and not very prominent, a whitish lateral line runs from wing cases to extremity of abdomen, above which is a black stripe that crosses two or three of the upper abdominal segments. The shape differs from that of *Philodice*, in the attenuation of the head case and lesser prominence of the process; also in the absence of the abdominal markings. This description, however, is given from the drawing."

Terias nicippe. Fabr.

"*Larva*. Pale green, with a dorsal ray more obscure, and a lateral white band, marked before with five yellow points."—BOISDÜVAL.

Food plants, various species of *Cassia* and *Trifolium*.

Chrysalis. Dull pale green, with the beak very sharply pointed, the entire surface sprinkled over with ferruginous spots. Wing region largely developed, the edges forming a sharp arcuate protuberance.

This species, so common in the Southern States and Mexico, must now be included in the list of Californian Butterflies, Mr. J. Behrens having during the past Summer received several specimens from San Diego.

Danaïs Archippus. Fabr.

Larva. Dull cream white, each segment banded regularly with black and yellow, thus forming alternate bands of black, yellow and white throughout the entire length, the white bands being broadest, and crossed transversely at their middle by the black bands. The yellow bands are also crossed transversely by a narrow line of black. The head and two posterior segments are devoid of white. The second segment has two long, black, fleshy processes, and the eleventh segment two shorter ones of similar form. Feet black, whitish at their sides. Under side of body dirty white.

Food plants, various species of *Asclepias*.

Chrysalis. Bright yellow green, almost pellucid, and resembling green ice. Short, and very much rounded. Thoracic protuberances small. In front on

the third segment are some small golden points, and behind the middle is a semicircle of gold, bordered below by a range of small, black dots.

Melitæa chalcædon. Bois.

Larva. Velvety black, finely irrorated with white. From third segment to last, seven rows of thick, many-branched spines, the dorsal row orange, the others blue-black, those of second lateral row rising from tuberculated orange spots.

Head black, bilobed, compressed, furnished with simple black spines. Feet and prolegs black. Under side of body dull flesh colored.

Food plants, *Scrophularia Marylandica* L., *Diplacus glutinosus*, *Mimulus luteus*, *Lonicera* sp., and the various species of *Casteleja*.

Length, 1.05 inch.

Chrysalis. Pearl-white, irregularly marked with points and patches of dark brown. On the abdominal region are several rows of orange spots, the same color appearing in the covering of the wings.

Melitæa Editha. Bois.

Larva. Dull black, with seven rows of many-branched spines, all of which have a bluish tint. Those of the second lateral row arise from tuberculated orange spots, as in *M. chalcædon*, but the dorsal row of orange spines, so characteristic of that species, is wanting in *Editha*. Feet and prolegs brown, inclining to a fleshy tinge.

Food plants, *Erodium Cicutarium*, various species of *Trifolium* and *Viola*.

Chrysalis. Cylindrical, shorter and rounder than *M. chalcædon*. Ground color dull cream-white, each segment with a transverse regular row of orange spots, bordered anteriorly by black dashes. On the wing covers are some broad, black, waved lines, and some black patches about the head and thoracic region.

Melitæa palla. Bois.

Larva. Dull black, with a double dorsal row of orange spots, forming, when viewed longitudinally, two interrupted lines. In the spaces between the spots, are some irregular white patches. Along the sides are two similar double rows of orange blotches, with white spaces about the spiracles. The spiracles themselves are black. Each segment is provided with five rather long spines, from each of which project about sixteen or eighteen long black hairs. The base of each spine is surrounded by a dirty white ring, and some minute white irrorations are scattered over the whole upper surface between the spines.

Head rather small, black, very glossy. Feet ash color, banded with black.

Length, 1.05 inch.

Food plant, *Casteleja breviflora*.

The caterpillars feed chiefly on the flowers, and are solitary in their habits,

only one being usually found on each plant. From ten larvæ taken in May, 1873, I obtained the following results :

Changed to chrysalis, May 16th-23d.

Imago, June 4th-13th.

Five ♂, four ♀; one died in chrysalis state.

Chrysalis. Fawn color, very faintly marked with pale brown dots and dashes over the entire surface. On the thorax are two raised, shining points, and each of the segments, except the two last, possesses a treble row of small, shining tubercles.

Phyciodes mylitta. Edw.

Larva. Head small, bronze black, entirely covered with short black hair. Viewed from above, the whole upper surface is velvety black, each segment being provided with six tubercular spines, very hairy to their tip. The lateral row of spines is dull ash color, with black hairs, the spines being shorter than those of the dorsal region. Feet and prolegs dull ash color, the under side of the body with a fleshy tinge.

Length, 0.75 inch.

Food plants, various species of *Carduus*.

This species is gregarious in its habits, and terribly destructive to the plant on which it may be hatched, in many cases only the nerves of the leaf remaining. The caterpillars spin a small web, and draw the leaves of the plant together.

Chrysalis, ash color, with a slight metallic reflection. Dorsal region with three rows of slightly raised tubercles. Anal extremity much incurved. Out of sixteen specimens taken on May 8th, three died in larval state, the rest transformed as follows :

Chrysalis, May 26th-June 5th.

Imago, June 6th-19th.

Ten ♂, three ♀.

Grapta satyrus. Edw. (Figured in "Edwards' Butterflies of North America.")

"*Larva*: Head black, angular, bilobed, spiny, and with a spiny tubercle at each of the upper angles; color of body black, with a broad greenish white dorsal stripe, which on the anterior segments is clouded with black; on each segment, on this stripe, is a fine V-shaped black mark, having its angle at the dorsal spine. The spines form seven rows, the dorsal greenish white, wanting on the first four segments, the first lateral row of same color, present on all segments from the second; the second lateral row black, the third greenish white, wanting on the first four and terminal segments, and springing from an infra-stigmatal line of the same color; and the spines are thinly covered with short bristling, concolored hairs, except that those near the tips of the white spines are blackish."—R. H. STRETCH.

Food-plant, *Urtica* sp. (Stinging Nettle.)

The above description was taken by Mr. Stretch from some specimens found by me at Congress Springs, Santa Clara County, in June, 1871. I only raised one specimen out of three; but the following year I was fortunate enough to perfect three other specimens, and recently, in Vancouver Island, four others, the markings of the larva state being remarkably constant in every instance.

Chrysalis, fawn-color, with a few darker markings irregularly placed. On each side of the abdomen, near its base, are three small semi-oblong silver spots, the posterior one with a trace of gold upon it. Thoracic protuberance large. Beak produced into a sharp point.

Changed to chrysalis, June 20th-26th.

Imago appeared July 4th-18th.

Grapta zephyrus. Edw.

Larva: Body furnished with six rows of many-branching spines; the segments, from second to eighth inclusive, bright buff inclining to orange, remaining segments pure white. Along the sides are two waved orange lines, uniting irregularly; the interspaces, which are buff or white according as they are anterior or posterior, are marked with black dots; above the orange lines are some faint black lines, and some black patches are discernible at the base of lateral spines. Spiracles black, broadly bordered with white. Head black, with short black spines at vertices. Under side of body dull flesh-color. Feet and prolegs with pinkish tinge. Length, 1.05 inch.

Food-plant, *Azalea occidentalis*.

Chrysalis, pale brown, the general shape as in *Comma*, but the mesonotal process more prominent and rounded, the palpi cases more produced and compressed at the base, the upper tubercles silvered.

The larva from which the above description was taken was found by me in the Yosemite Valley, July 3d, 1871. Changed to chrysalis July 29th, the perfect insect emerging on the 15th of August. The species is very common near Virginia City, Nevada, and in many of the warm valleys of the Sierra.

Vanessa antiopa. Linn.

Larva, velvety black, entire surface covered with white irrorations. A deep black dorsal line; each segment provided with four spines, the inner ones being branched, the outer ones simple; the second segment is, however, destitute of spines. At the base of the seven middle bundles of spines is a reddish-chestnut tubercular patch. Head black; prolegs black; feet chestnut, fleshy beneath.

Length, 2 inches.

Food-plants, various species of willows, and occasionally on rose-bushes.

Chrysalis, brownish gray, with some darker markings. Palpi cases produced into a sharp spine. Thorax with three spines on its dorsum, the middle one large and slightly recurved, two minute ones near its base. The sides of the thorax are produced into a ridge, armed with two spines. Wing-cases also with a small spine toward their extremities. The third and fourth segments are pro-

vided with two spines each, the fifth, sixth, seventh, and eighth with three spines, the middle row being extremely small.

Length, 1 inch.

Vanessa Milberti. Godt.

Larva, dull olivaceous, with blackish tinge, whole surface covered with indistinct black dots. A narrow, black dorsal line. The sides below the stigmata are stone color. Each segment is armed with five black spines, from which spring some short black hairs. Stigmata inclosed in waved, irregular black band, with a pale pinkish space above and below it. Stigmata black, encircled with dull white, or stone color. Head and prolegs black; rest of the under side stone color.

Length, 1 inch.

Food-plant, *Urtica* sp. (Stinging Nettle.)

Chrysalis, dull ash color, with darker dots scattered irregularly over the whole surface. Thoracic protuberances almost obsolete. Palpi cases produced into a short, sharp spine. Abdominal region with three rows of short, shining points, slightly silvered at the tip; there is also an indistinct dash of silver at the base of the head. Wing cases paler in color than the rest of the body. Length, 0.75 inch.

Pyrameis Huntera. Sm. Abb.

Larva, blackish gray, striated with yellow, the first four segments more obscure than the remainder. Along the feet, and below the stigmata, is a yellow lateral ray, and above these is another yellow ray, marked with a small orange spot above each stigma. Stigmata brownish. All the spines are yellow.

Food-plants, various species of *Gnaphalium*.

"*Chrysalis*, yellowish, moderately angular, scattered with a large number of golden spots."—BOISDUVAL.

Pyrameis Cardui. L.

Larva, brownish, with four yellow interrupted lines, two dorsal and two lateral. Head greenish black. The third and fourth segments have four spines each; the fifth to the eleventh, inclusive, have seven spines each; the twelfth has four spines, and the thirteenth only two. The spines are brownish black."—STANITON.

Food plants, various species of thistles. (*Carduus*, *Oniscus*.)

The larva is solitary in its habits, and draws up the leaves on which it is feeding with its threads.

"*Chrysalis*, grayish brown, angular, scattered over with golden spots, which sometimes cover nearly the whole surface."—MORRIS.

Pyrameis Atalanta. Linn.

Larva, yellowish gray, with a pale yellow lateral line. Third and fourth segments with four moderate blackish spines; the fifth to twelfth segments, inclusive, with seven spines. Between the second and third row of spines is a row of black V-like marks. Head and legs black; prolegs reddish. The ground color is rather inclined to vary, being frequently of a violet hue; it then appears as if powdered with gray.

Food-plant, *Urtica* sp. (Stinging Nettle.)

The caterpillar, according to Sepp, shortly after it is hatched, selects a nettle-leaf, which it draws together with threads into a roundish hollow form, leaving for the most part an opening into the interior both before and behind—thus serving both for shelter and food until almost devoured, when it selects a fresh leaf, and proceeds with it in the same manner; one caterpillar only being found on a single leaf—thus indicating a peculiar liking for a solitary life; a circumstance confirmed by the eggs being laid solely and apart, whereas caterpillars hatched from eggs deposited in clusters are gregarious. The caterpillar state lasts about five weeks.

"*Chrysalis*, blackish, moderately angular, covered with a grayish efflorescence, and ornamented with golden spots."—BOISDUVAL.

Junonia coenia. Hubner.

Larva, blackish, pointed with white; lower side of abdomen and feet fulvous. It has two lateral white lines, of which the upper is marked with a row of fulvous spots.

"*Chrysalis*, like those of *P. cardui* and *P. Huntera*, but blackish, varied, and whitish, without any metallic spots."—BOISDUVAL.

The above description is too brief, but, in the absence of specimens from which to draw up a more complete one of this familiar insect, I am for the present compelled to be contented with it.

Limenitis Lorquini. Bois.

Chrysalis, dull fawn color; shining. Palpi cases very short. Thoracic protuberance rather short, triangular. The two basal segments of abdomen produced dorsally into a high semicircular process, flattened at the sides. The fifth, sixth, seventh, and eighth segments have each a black, shining, raised point at their posterior margins, and a black oblique dash is also seen at the junction of the wing cases with the abdomen. Length, 0.85 inch.

Limenitis Californica. Butler.

Chrysalis, short; very much thickened over the wing cases, tapering abruptly to the anal extremity. Dark fawn color, with occasional brown markings. The palpi cases are long, curved downward in front, and black at their

tips. Wing cases broadly margined, especially toward their extremities. Thorax with very short, blunt process. On the base of the abdomen is a high protuberance, notched in front, which runs into a longitudinal ridge toward the anal extremity. Wing cases pale, showing the coloring of the wings. The chrysalis is attached to the trunks of trees by a large silken web, not less than half an inch in diameter.

Length, 0.80 inch.

[From the Proceedings of the California Academy of Sciences, November 3d, 1873.]

Pacific Coast Lepidoptera.—No 3. Notes on some Zygœnidæ and Bombycidæ of Oregon and British Columbia; with descriptions of New Species.

BY HENRY EDWARDS.

I have brought together the following notes on species observed during a recent tour through Oregon, Washington Territory, and Vancouver Island, in the hope that they may prove interesting as regards the geographic range of the insects observed; while the new species described—which were collected during a somewhat hurried trip, and under many unfavorable circumstances—will serve to show the richness of the region traversed, and probably to call the attention of entomologists therein to a closer investigation of the many beautiful forms by which they are surrounded.

Fam. ZYGÆNIDÆ.

Alypia Sacramenti. Grote.

A fine specimen of this insect was taken by me at the Dalles, Oregon, in July, and another by Mr. G. R. Crotch at Lake Quesnelle, B. C., in August; so that it appears to have a far wider range than has hitherto been ascribed to it. I may add, that I again observed the habit cited by Mr. Stretch, in his "Bombycidæ of North America," of feigning death when captured. My present specimen had flown through an open door of a house in the town (no doubt attracted by some flowers in the window) and was found by me resting against the wall. Having no net with me, I placed a large pill-box under it, intending to shut it in; but, to my astonishment, before I could get the lid of the box above it, the insect fell backward into its prison, and lay as if dead until I reached my hotel, a distance of some three hundred yards. This habit is the more remarkable, as the other species of the genus are remarkably restless insects, taking flight at the smallest noise or other disturbing cause.

Alypia Ridingsii. Grote.

Four specimens taken near Cariboo, B. C., in May, by Mr. Crowley, who told me that it was quite common in that locality.

Alypia, sp.

In a small collection made by Mr. Crowley, in British Columbia, I noticed a very remarkable new species of *Alypia*, in which the hind wings were nearly wholly yellowish white, with very long fringes. The specimen was unset, and the case sealed up, so that I could not obtain access to it for the purpose of description.

Scepsis Matthewi, n. sp.

♂. Head dull black. Tongue chestnut brown. Palpi dull yellow, black at their tips. Antennæ bluish black, much longer than those of *S. fulvicollis*, with the pectinations larger and more distinct. Prothorax yellow, differing in tint in different individuals, and apparently fading with the age of the specimen. Thorax and patagia smoky drab, with a slight blackish tint in front. Abdomen bluish black above and below. Legs bluish black. Anterior wings perfectly opaque in fresh specimens, smoky drab, with a slight golden reflection. The costa is a very little paler, and the whole of the nervures are blackish, distinctly marked. Posterior wings, bluish black, with a broad longitudinal hyaline patch extending, in most specimens, through the whole extent of the wing, and even passing through the margin.

♀. Same as the ♂, but with the pectinations of the antennæ more simple, and the abdomen more robust.

Expanse of wings, 1.60 inch. Length of body, 0.55 inch.

Vancouver Island. August. Common.

The pale color of the upper wings, the length of the antennæ, and the more extended hyaline patch of the posterior wings, as well as the larger size of the entire insect, will serve to distinguish this species from *Scep. fulvicollis*.

It was taken in some abundance at Skinner's Bottom, near Victoria, by myself and my friend, Mr. Gervase Mathew, of H. M. S. *Repulse*, to whom I have great pleasure in dedicating it. Its habitat was the side of a lagoon overgrown with rushes. When disturbed, it flew slowly for a short distance, alighting again on the stems of the reeds, and was by no means difficult of capture. In this respect it differs exceedingly from *S. fulvicollis*, as that species, so far as my experience goes, has a rapid and continuous flight.

Fam. NYCTEOLIDÆ. H. S.

Sarothripa Columbiana, n. sp.

Head dull white beneath, pale sea green above. Palpi dull white. Eyes brownish black. Antennæ brownish beneath, greenish white above. Feet wholly greenish white. Thorax pale sea green, with three black spots placed triangularly in front, and a large black blotch (in the center of which is a grayish green space) at the base. Prothorax velvety black, narrowly edged behind with sea green. Patagia sea green, blotched with white, with a double black line posteriorly. Abdomen smoky white, concolorous with the posterior wings.

Anterior wings pale sea green, indistinctly blotched with white toward the middle of the costa and the posterior margin. The velvety black markings, which give so beautiful an appearance to this insect, are very variable in their intensity; but the following may be regarded as their normal form. Central fascia much waved posteriorly, in its middle approaching the disc, and inclosing a clouded patch near the costa, which surrounds a deep black discal spot. Anteriorly, the central fascia is only slightly waved, very distinct on the outer edge, but shading to a black cloud on the inner margin. At the base of the wing are four more or less waved black lines, the two broad ones being most distinct, and the others broken up into irregular patches. Near the posterior margin is a notched line of black, which joins the central fascia on the interior margin, and on the posterior margin itself, is a row of nine minute angular patches, also velvety black. Fringe gray, mottled with sea green.

Posterior wings, smoky white, clouded toward the outer margin, which has occasionally some faint black lines at the base of the fringe. Fringe smoky white.

Expanse of wing, 1.10 inch. Length of body, 0.40 inch.

The ♀ is a little larger than the ♂, but is in every other respect quite similar.

Victoria, V. I., at rest on palings. August. Not rare.

I at first thought that this insect might be one of the numerous varieties of the European *S. Revayana*, but a comparison has convinced me that they are distinct. The present species may be known by its beautiful pale but rich sea green color, by the distribution of the markings of the thorax, and by the greater width and more rounded apices of the fore wings. It does not appear to be rare, though its habit of sitting in close proximity to lichens resembling it in color renders it liable to be overlooked.

Fam. LITHOSIDÆ. H. S.

Lithosia candida, n. sp.

Head and thorax silvery drab. Antennæ and palpi chestnut brown, whitish at base. Eyes large, black, with white reticulations. Abdomen silvery white, above and below. Feet smoky. Anterior wings clear silvery white, with a very faint yellowish tinge on the costa. Posteriors dull creamy white, slightly smoky toward their costal margins.

Under side, with the whole of the anterior wings and the costal margins of posteriors, smoky. Fringes white throughout.

Expanse of wings, 1.45 inch. Length of body, 0.55 inch.

This beautiful species was taken by me at a gas-lamp, in Victoria, V. I., in August. It is abundantly distinct from any North American species known to me.

Clemensia irrorata, n. sp.

Head, thorax, patagia, and abdomen, chalky white, with a few grayish brown hairs. Antennæ white, brownish at their tip. Palpi yellowish brown at base,

black at their tips. Anterior tarsi with blackish patches, remainder of feet and legs chalky white. Anterior wings cream white, covered over the entire surface with black irroration. Along the costa are six well-defined sub-triangular patches, brownish black, almost equidistant, the basal one being the smallest. On the posterior margin are also seven equal brownish spots, the apical and middle one of which extend into the white fringe. At the base are two indistinctly waved lines of brownish black, two others near the middle extending from the costa to the median nerve, a brownish discal patch, and some irregular brownish blotches, toward the apex and posterior margin. On the first dorsal nerve are three small brownish spots. Posterior wings smoky white; fringes white, blotched with brown on the anterior angle.

Under side. Anterior wings smoky, darkest toward the costa, with some fawn-colored blotches toward the apex.

Posteriors smoky white, with a tuft of fawn-colored hairs on the anterior margin, and a small clouded discal spot. Margins of both wings with an interrupted black line.

Expanse of wings, 0.85 inch. Length of body, 0.25 inch.

Victoria, V. I.

Taken at rest on trunks of pine trees, by myself and Mr. G. R. Crotch, in August. This is now the third species known of this interesting genus. *Clemensia albata*, Pack, is somewhat common in the Atlantic States. *C. umbrata*, Pack, is known only through a unique specimen taken by myself at Congress Springs, Santa Clara County, which was, unfortunately, destroyed in its passage through the post from Dr. Packard's hands to mine. Luckily, however, an excellent drawing of it was obtained by Mr. R. H. Stretch, which has appeared in his "Bombycidae of North America," and will serve to keep the species in remembrance until its capture can be again recorded. Our Coast will probably furnish other species, which may be sought for in pine woods, sitting on the trunks of trees during the day.

Fam. ARCTIIDÆ. H. Sch.

Epicalia virginalis. Bdv.†

Apparently abundant in Oregon and Vancouver Island. I saw many specimens in the collections of Mr. Cox and Mr. Harvey, of Victoria, and took a few fine specimens in Portland, Oregon, in July, when it flew in some numbers about the streets of the city.

Epicalia guttata. G. and R.

This form, which, according to the observations of Mr. Stretch and myself, can only be regarded as an extreme variety of *E. virginalis*, was taken by me in both the above localities, equally common with the typical form, and manifesting precisely the same habits.

Leptartia. Stretch.

I saw three distinct varieties of this genus in the small collection of Mr.

Harvey, of Victoria ; but I am unable to say to what species they belong, as I could not obtain them for comparison.

Arctia Americana. Harr.

During my stay in Victoria, I took four specimens of this beautiful insect, and examined five others, all of which were distinguished by the white margins of the prothorax and patagia, and by the absence of black spots on the sides of the abdomen.

Arctia achaia. Bdv.

Rather common in Portland, Oregon ; coming freely to light, and not unfrequently found at rest on walls and palings.

Arctia, sp.

A very beautiful species of this genus—in which the male has stone-colored markings to the hind wings, like *A. Quenselii*, and the female bright orange patches—is not uncommon in May, in Victoria ; but I could not obtain a specimen for description.

Other *Arctias* will probably be found in the regions treated of ; one exquisite species recently described by Mr. Stretch as *A. superba*, having been taken at Esquimalt, V. I., by Dr. Bremner, of H. M. S. *Zealous*, and by him kindly presented to me.

Leucartia acraea. Pack.

Seven specimens taken at gas-lamps, in July, at the Dalles, Oregon.

Pyrrharctia Isabella. Pack.

A fine ♂, in no respect differing from my specimens from the Atlantic States, taken at Portland, Oregon, in July.

Spilvosoma virginica. Walk.

Eleven specimens, at Portland, Oregon, in July, presenting very slight variations among themselves in the number and size of the black spots.

Hyphantria textor. Harr.

Two ♀ taken on the wing at Portland, Oregon, in July.

Halesidota Agassizii. Pack.

I found two specimens of the larva feeding, as usual, upon willows ; and saw in a small collection, in Victoria, two examples of the perfect insect.

Halesidota argentata. Pack.

Two fine ♂ of this beautiful species were taken in the streets of Victoria during my stay.

Antarctia punctata. Pack.

Not rare in Oregon. I saw several specimens, of as many varieties, in a small collection belonging to Mr. O. Johnson, of Portland.

Phragmatobia, sp.

A specimen in the collection of Mr. Cox, of Victoria, certainly in no respects different from the European *P. fuliginosa*.

Fam. EPIALIDÆ. H. Sch.

Epialus modestus. Hy. Edw.

A specimen taken by Mr. G. R. Crotch, near Gold Stream, V. I., and by him kindly added to my collection.

Fam. LIPARIDÆ. Bdv.

Orgyia badia, n. sp.

Egg. Ovale, flattened at the upper end, chalky white, with dark spot at the apex; attached in large masses, and surrounded by the hairs from the body of the mother.

Larva. ♂. Deep velvety black, with a double dorsal yellowish stripe on the three posterior segments. From the head spring two black plumose series of hairs, and one of the same description from the posterior segment. On the dorsal region are four shorter plumes of hairs, dark buff, shaded with brown, and behind these are two naked scarlet tubercles. The rest of the body is covered with long yellow spines on the sides of the dorsal plumes, springing from scarlet tubercles, and near the lateral region are four yellow tubercles, below which is a slightly waved interrupted stripe of bright yellow. Head black, shining. Under side smoky. Feet and prolegs yellow.

Same as the ♂, but larger, and with the plumose tufts much shorter.

Food plant, *Rubus* of various species. Fully fed in the early part of August, spun their web from the 4th to 11th, and the perfect insects emerged from the 18th to 30th.

Imago. ♂. Head, thorax, palpi, and antennæ chestnut brown. Abdomen with a blackish tinge. Feet and legs fawn color, the anterior tarsi banded with brown.

Anterior wings rich deep chestnut, with a rather broad band of pale yellowish brown crossing them near the middle, attaining its greatest width anteriorly. Near the posterior angle is a well defined clear white spot. Fringes dark brown. Posterior wings rich chestnut, a little paler towards the base. Fringes bright chestnut. Under side entirely rich chestnut brown, with a darker blotch toward the anterior margins.

Expanse of wings, 1.30 inch. Length of body, 0.50 inch.

♀. Entirely light drab. Wings rudimentary. Tarsi pitchy. Length of body, 0.60 inch.

Victoria, V. I. Quite common about the streets of the city, where it appears to take the place of *O. antiqua* of Europe.

Fam. BOMBYCIDÆ. Bdv.

Clisiocampa. Curtis.

I obtained four species of this genus; three from Oregon, and one from Vancouver Island, all of which appear to me to differ from our California species. A monograph of the group is much needed.

Fam. SATURNIDÆ. Bdv.

Teia polyphemus. Hbn.

Apparently not rare in Vancouver Island. I detected some seven or eight specimens in the small collections of Messrs. Cox and Harvey. This insect, though one of our Pacific Coast varieties, has nevertheless a wide range. I have seen specimens from Victoria, northern and middle California, San Diego, Cape St. Lucas, and San Blas, Mexico.

Pseudohazis eglanterina. Bdv.

Rare in Vancouver Island, abundant on the main land near New Westminster, and not rare at Portland, Oregon.

Fam. DREPANULIDÆ. Bdv.

Drepana sicutifer. Pack.

Two specimens, ♂, ♀, in all respects agreeing with the California form described under the above name by Dr. Packard, were taken by Mr. Crotch in Vancouver Island.

Fam. NOTODONTIDÆ.

Lacinia expultrix. Grote.

One specimen exactly agreeing with those sent me by Mr. Graef, and taken by that gentleman in New Jersey, was obtained by Mr. Crotch near Cariboo, B. C.

Fam. CYMATOPHORIDÆ. H. Sch.

Thyaira detersa. Brd.

Some time since, Dr. Behr gave me a specimen of this insect from Alaska, and I myself took a solitary example in the streets of Victoria. Our specimens are rather smaller than those in my cabinet from Europe, and have a more rosy tint on the upper wings; but the difference is not sufficient even to hint at the existence of a second species.

Cymatophora improvisa, n. sp.

Head gray with a rosy tinge, palpi short, dark brown, black at their tips. Antennæ light chestnut brown, whitish above. Tibiæ and tarsi light brown,

banded with black, with a rosy hue at their base. Thorax and prothorax velvety black. Patagia gray. Abdomen olive gray above and below, tip rosy.

Anterior wings rich olive brown, with a yellowish-green blotch at the base, and an oblong one at the apex, which latter rests on a narrow waved line of the same color running to the interior margin. Central fascia smoky gray, broadest toward the costa, and much notched anteriorly, the brown spaces on each side being traversed by several indistinct waved black lines. On the costa toward the apex are some minute rosy streaks directed toward the center of the wing. Posterior margins with a row of velvety black, lunate marks. Fringes rosy gray. Posterior wings very glossy, with a rosy hue, and a row of indistinct lunate black marks along the margin. Fringes rosy gray. Under side dull smoky gray, darker toward the margins, with a waved brown line across the middle of the lower wings.

Expanse of wings, 1.60 inch. Length of body, 0.65 inch.

From chrysalis found under a log at Cascades, W. T., in July. The moth emerged in September. The chrysalis was a bright chestnut brown, enclosed in a thin web, with which a large number of particles of sand had been incorporated.

LIST OF NEW SPECIES.

<i>Scepsis Mathewi</i> ,	Vancouver Island.
<i>Sarothripa columbiana</i> ,	Vancouver Island.
<i>Lithosia candida</i> ,	Vancouver Island.
<i>Clemensia irrorata</i> ,	Vancouver Island.
<i>Orgyia badia</i> ,	Vancouver Island.
<i>Cymatophora improvisa</i> ,	Washington Territory.

[From the Proceedings of the California Academy of Sciences, February 17th, 1874.]

**Pacific Coast Lepidoptera.—No. 4. Descriptions of some New
Genera and Species of Heterocera.**

BY HENRY EDWARDS.

Family ARCTIIDÆ. H. S.

Spilosoma (*Diaphora*, St.) *pteridis*, n. sp.

Caterpillar. Head very shining, bright chestnut brown. Body dirty white, mottled with black patches, giving a slate colored tinge to the surface, with three indistinct lines of yellowish-white, two lateral, and one dorsal. Hairs springing from small tubercles, orange-brown, inclining to chestnut, entirely hiding the ground color of the body. Feet and prolegs pale chestnut.

Length, full grown, 1.80 inch.

Food plant, *Pteris aquilina*.

Changed to chrysalis, August, September. Imago appeared February.

Chrysalis. Formed usually at the base of the fern fronds, a few leaflets being loosely drawn together, and connected by a rather stout web, through which the chrysalis is indistinctly seen. Chrysalis short, rounded in front, blackish-brown, with a few pale brown hairs about the posterior segments.

Imago. ♂. Head, thorax, and abdomen fawn drab, covered with long hairs. Antennæ bright fawn color above, with black pectinations, wholly black beneath. Palpi brownish-black. Wings with the whole upper surface dull smoky-brown, a little darker towards the margins, and with a black discal spot on each. Primaries slightly waved in front on the posterior margin. On the interior margin of the secondaries is a row of hairs of the same color as the abdomen. Feet and legs fawn drab. Fringes blackish.

Under side, wholly fawn drab, reddish along the costal margins, with the discal spot very distinctly shown.

♀ Head and thorax red brown, the former almost scarlet in front. Antennæ and palpi orange red. Abdomen yellowish fawn-color. Feet and legs chestnut brown, with bright red scales above, especially on the middle pair. Fore wings slightly hyaline, reddish chestnut, immaculate, with the nervures very distinctly marked. Costa more decidedly reddish. Fringe chestnut, marked with blackish atoms. Lower wings smoky, with black spot beyond the disc. Fringes pale chestnut, marked with blackish streaks. Under side, wholly dull buff. Costa reddish chestnut. On the disc of each wing is a black lunate mark. The ♀ of this species bears a remarkable resemblance to many specimens of the European *Phragmatobia fuliginosa*, as well as to the same sex of the Cali-

for *Antarctia punctata*. It may, however, be readily distinguished by its more delicate form, by the absence of spots or other markings, and by the paler color of the under side.

Length of body, 0.50 inch. Expanse of wings, 1.05 inch.

Vancouver Island. (Coll. Hy. Edw.)

Fam. EPIALIDÆ. H. S.

Epialus Mathewi, n. sp.

♂. Head dark brown, pale above. Thorax and abdomen chestnut, inclining to orange. Antennæ and feet reddish-brown. Fore wings luteous, palest at their margins. At the base is a reddish-brown patch, out of which proceeds a silver-white streak, (edged outwardly and inwardly by a narrow black line) which for a short distance follows the course of the subcostal nerve, then gradually widens and touches the interior margin near the middle, spreading thence upward and outward toward the anterior angle, but becoming obsolete before reaching the extremity, and passing off into irregular black patches with white centers. The edges of this streak are very irregular in outline. Near the disc is a small and indistinct white spot, edged with black, and another is situated near the middle of the interior margin, while the posterior margin is marked with a row of black blotches, not extending to the anterior angle.

Secondaries clouded with fuscous at the base, reddish chestnut toward the margin, with two fuscous submarginal bands united near the middle to the fuscous basal cloud. Fringes of both wings entirely reddish-chestnut.

Under side, pale yellowish-brown, irregularly blotched with fuscous, with the white streak of the upper side very imperfectly seen.

♀ A little larger than the ♂, paler in its general color, with the markings considerably fainter.

Length of body, ♂, 0.70 inch; ♀, 0.80 inch.

Expanse of wings, ♂, 1.40 inch; ♀, 1.65 inch.

Vancouver Island. Mr. Gervase Mathew, H.M.S. *Repulse*, who has kindly added this beautiful and interesting species to my collection.

Fam. BOMBYCIDÆ. Bdv.

Thauma, nov. gen.

Head small, almost concealed by the long hairs which cover all parts of the thorax. Antennæ of the ♀ serrated from base to apex, the serratures largest beyond the middle. Palpi very short, concealed. Thorax densely covered above and below with long hairs, which extend over the base of the wings. Abdomen extending as far as the margin of the hind wings, covered with short hairs, and with a short anal tuft. Legs stout and rather short, of almost equal thickness throughout their entire length. Middle and hind tarsi five-jointed, the last joint receiving and almost concealing the claws. Wings ample, opaque, straight in front, slightly curved outwardly toward their tip, and considerably rounded on their posterior angles. Discal cell very large, subcostal vein reach-

ing the costa a little beyond the middle. The nervures are widely separated toward the posterior margin, gradually decreasing in the width of their interspaces as they approach the anterior angle. This genus is in many respects allied to *Endromis* of Europe, but differs somewhat in the neururation, and in the longer and less pilose abdomen. Perhaps its nearest relations will be found in the South American genera *Ormiscodes* and *Podalia*.

Thauma Ribesii, n. sp. (♀).

Head dull smoky-brown. Thorax smoky in front, chestnut towards its base, hairs very long, smoky, interspersed with gray. Abdomen bright chestnut, darkest toward the anal extremity. Antennæ pale straw color. Feet and legs smoky. Primaries smoky, darkest along the costa. A little distance from the base is a waved whitish line, extending to the costa, broadest at this extremity, and gradually becoming obsolete as it reaches the interior margin. Resting on this is a large white triangular mark, filling up a considerable portion of the discal cell, and looking, when viewed with the wings folded, like the letter V. The right branch of this mark touches the basal fascia, and the left one the subcostal nerve, while its base rests upon a distinct and slightly notched whitish band extending entirely across the wing, widest at the costa, and most deeply notched at its junction with the above V-like mark. The posterior margin broad, smoky, with the nervures yellowish-brown. Both the fasciæ are bordered (the basal one inwardly, and the marginal one outwardly) with blackish scales.

Secondaries, dull smoky, inclining to chestnut towards their base. A little below the disc is a small linear whitish patch, and beyond a waved line of dull smoky black, edged interiorly with whitish scales. Fringes of both wings very short, concolorous.

Under side, primaries with the markings of the upper side indistinctly seen, the marginal fascia becoming smoky black, and the white V-like mark of the upper side a dull yellowish-brown. Secondaries with the waved line very distinctly marked, whitish, bordered externally with black.

Length of body, 1.05 inch.

Expanse of wings, 2.70 inches.

Esquimaux; Vancouver Island; Mr. G. Mathew.

This magnificent addition to our insect fauna was raised from the caterpillar stage by my friend Mr. Mathew, who may justly be complimented on the discovery of so remarkable a species. Mr. Mathew describes the caterpillar as being black, with dense and strong spines. It was feeding upon *Ribes divaricatum*, Dougl. Changed to chrysalis in September; Imago appeared October. I hope at some future time to be able to give a more extended description of the earlier stages of this fine insect.

Fam. NOTODONTIDÆ. B.

Stretchia, nov. gen.

Head small, tufted in front. Palpi short, stout, porrect, not extending beyond the head. Proboscis moderate. Thorax slightly crested in front. Ab-

domen pilose, extending for one-third of its length beyond margin of secondaries. Antennæ rather coarsely pectinate. Tibiæ with long hairs. Tarsi simple. Primaries with the costal edge straight, acute at its tip. Posterior margins rounded interiorly. Interior margins oblique, tufted in the middle. Some plumose tufts are also visible along the costa and subcostal vein. Secondaries small, with the margins much rounded. Larva unknown.

This genus, which appears to bear a close relation to *Edema*, Walk., I have dedicated to my friend, Mr. R. H. Stretch, whose exquisite work on the "Bombycidae of North America" is an honor to entomological literature.

Stretchia plusiiformis, n. sp.

Head and palpi brownish-gray, sprinkled with white. Thorax gray, mottled with black, with the anterior edge bright reddish-brown. Abdomen brownish stone color, with a black transverse streak, edged with white on the basal segment. Feet and legs brownish-gray, mottled with black. Antennæ dull fawn color. Primaries cinereous, sprinkled over the whole surface with black irrorations. Following the costa, and reaching a little below the subcostal vein, is an irregular pale-gray patch, clouded with black and reddish-brown, reaching its greatest width near the disc, and then becoming paler and more distinct, so as to resemble the markings of many species of *Plusia*. Near the posterior margin is a faint brownish waved line, edged near the interior angle with black. The nervures are black, interruptedly marked with gray. Interior margin with a grayish tuft beyond the middle. Fringes short, brownish-gray, mottled with black. Secondaries pale fuscous, with the nervures very distinct. Fringes a little darker anteriorly.

Under side entirely fuscous, the primaries darker towards the costal margin, and with a very faint brown discal spot. *Secondaries covered with paler irrorations and with a well defined lunate discal mark. Abdomen beneath dark brown.

Length of body, 0.60 inch.

Expanse of wings, 1.35 inch.

White Pine, Nevada. Taken on the wing, in August, by Mr. W. S. Edwards.

LIST OF NEW SPECIES.

<i>Spilosoma pteridis</i>	Vancouver Island.
<i>Epialus Mathewi</i>	Vancouver Island.
<i>Thauma Ribesii</i>	Vancouver Island.
<i>Stretchia plusiiformis</i>	White Pine, Nevada.

From the Proceedings of the California Academy of Sciences, July 6th, 1874.

Pacific Coast Lepidoptera, No. 5—On the Earlier Stages of some
Species of Diurnal Lepidoptera.

BY HENRY EDWARDS.

Since the publication of my last paper on this most interesting branch of entomological research, I have been fortunate enough to make myself acquainted with the earlier stages of some of our butterflies, previously unknown to me, and have, in addition, received from friends some MS. notes on other species; while from various publications I have gleaned a few particulars concerning others. The whole of this information I have endeavored to place in a concise form before the student, and I believe that the present and previous articles will be found to contain all the knowledge we possess concerning the earlier stages of our diurnal Lepidoptera. It will readily be seen how small is its amount, and how grand a field for observation is still open to those who desire to pursue so interesting an inquiry. To those living in the country a more agreeable and fascinating amusement cannot well be conceived, than the watching and rearing the larvæ of insects; and a very little practice in the matter will serve to increase its charm, while it will make the task more easy, and, at the same time, render almost incalculable benefit to those scientific observers who, living in cities, have not the time and opportunity at their command to devote to this branch of study.

As previously stated, I shall be happy to afford any information in my power, and will at all times gladly award to any who may assist me, all the credit due to their discoveries.

Papilio Daunus.

Chrysalis. General shape the same as *Rutulus* and *Eurymedon*, but a little shorter and stouter proportionately, and considerably darker in color, which is dark greenish-drab, with the dorsal region broadly and distinctly shaded with black. The mesonotal process is very rough, and the antennal cases decidedly black. The wing cases are streaked with blackish-brown. The head is marked with a broad, fawn-colored patch, and a streak of the same color is along each side of the abdomen, indicating the pale yellow stripes on each side of the body of the imago.

Length, 1.60 inch.

I regret to be able to add little with reference to the larval state of this beautiful insect. I am informed by Mr. W. T. Eaves, of Virginia City, (to whom I am indebted for a number of specimens of the chrysalis) that the caterpillar is dull green, with some yellowish stripes, and that it feeds upon a species of wild

cherry, common in Nevada. Those found by Mr. Eaves changed to chrysalis late in April, and from ten specimens presented to me, I was fortunate enough to raise six males and four females, all in perfect condition. They emerged from the 27th of May to the 8th of June.

Pieris protodice.

Larva. "Average length when full grown, 1.15 in. Cylindrical, with the middle segments largest. Most common ground color, green, verging on blue, sometimes clear pale blue, and at others, deep indigo or purplish blue. Each segment has six transverse wrinkles, (of which the first and fourth are somewhat wider than the others) four longitudinal yellow lines equidistant from each other, and each interrupted by a pale blue spot on the before mentioned first and fourth transverse wrinkles. There are traces of two additional longitudinal lines below, one on each side, immediately above the prolegs. On each transverse wrinkle is a row of various sized, round, black, polished, slightly raised piliferous spots, those on wrinkles one and four being largest and most regularly situated. The hairs arising from these spots are stiff and black. Venter rather lighter than ground color above, and minutely speckled more or less with dull black. Head same color as the body, covered with black piliferous spots, and usually with a yellow or orange patch on each side, quite variable. The black piliferous spots frequently have a pale blue annulation around the base, especially in the darker specimens. When newly hatched, the larvæ are of an uniform orange color with a black head, but become dull brown before the first moult, though the longitudinal stripes and black spots are only visible after that moult has taken place.

Chrysalis. Average length, 0.65 inch.

"It is as variable in depth of ground color as the larva. The general color is light bluish-gray, more or less intensely speckled with black, with the edges and prominence marked with buff or flesh color, and having large, black dots." C. S. Minot in *Am. Entomologist*, vol. II, p. 77.

The caterpillar of this common species feeds on various cruciferous plants, and may be sought for in the San Joaquin and other valleys, where the butterfly occurs in great abundance, though it is somewhat periodical in its appearance. It is probable that it will one day become a serious pest to our market gardener, as cabbages and other allied plants suffer largely from its attacks.

Anthocaris ausoniedes. Bdv.

Larva. Head round, green, speckled with black. Body long, slender, dotted with black granules, and marked with three lead-colored stripes. Between these are two yellow stripes of similar width. The lateral lead-colored ones are edged below with white shading into yellow. Under side, bluish-green. Feeds on cruciferæ, the larva attaining its growth early in July, and changing to a curiously-horned chrysalis, which tapers gradually and almost equally towards each extremity. At first glance, it much resembles a brown and curled-up leaf. The perfect insect escapes the following season."—T. L. MEAD.

I am indebted for the above description to my friend Mr. Mead, of Cornell University, who discovered the larva of this somewhat rare species in his tour through Colorado, and who was successful in raising it to maturity.

Colias coesonia. Godt.

This species has been found near San Diego by Mr. James Behrens, and must, therefore, be included among our California butterflies. The following brief description is the only one at my command :

"*Larva.* Green, with a lateral white band, punctured with yellow ; besides this band, there is on each segment a transverse black band, bordered with yellow. Feeds on different species of *Trifolium*."—BOISDUVAL.

Terias lisa.

This and the following species have also been taken near the Mexican border. The descriptions of the larvæ, by Boisduval, are very vague and unsatisfactory, but I append them, having at present no better to offer :

"*Larva.* Green, with four longitudinal white rays. Feeds on *Cassia* and *Glycina*.

"*Chrysalis.* Green."—BOISDUVAL.

Terias delia. Cramer.

"*Larva.* Green, with a longitudinal white line on each side, above the feet. Feeds on *Cassia*, *Glycina*, and *Trifolium*.

"*Chrysalis.* Green."—BOISDUVAL.

Danaïs Berenice. Cramer.

"*Larva.* Whitish violet, with transverse stripes of a deeper color, a transverse band of reddish brown on each ring, divided in its length by a narrow yellow band. Along the feet, a longitudinal band of citron yellow. Long, fleshy processes of brown purple are disposed in pairs on the second, fifth, and eleventh rings. Feeds on *Nerium*, *Asclepias*, etc.

"*Chrysalis.* Green, with golden points on the anterior side, and a semi-circle of the same color on the dorsal side, a little beyond the middle, separated from a blue band by a row of three black dots."—BOISDUVAL.

Found, but rarely, in the vicinity of San Diego.

Agraulis vanillæ. Bois.

"*Larva.* Cylindric, pale, fulvous, with four blackish longitudinal bands, of which the two dorsal are sometimes obsolete ; furnished with ranges of blackish ramose spines, of which two are placed on the summit of the head. Head with a whitish ray on each side, lined with black ; feet, black. Feeds on *Passiflora*, etc.

"*Chrysalis.* Russety brown, with some paler shades."—BOISDUVAL.

Abundant in Lower California, and occasionally straying beyond the border. It has been taken on several occasions in the foothills near San Diego.

Argynnis myrina. Cram.

This species, which occurs somewhat abundantly in Alaska and British Columbia, has been reared from the egg by Mr. Sanders, who thus describes its various stages:

"*Egg*. Pale green, elongated, shaped something like an acorn, with the base smooth, convex, and the circumference striated longitudinally, with about fourteen raised striæ, which are linear and smooth; the spaces between are about three times wider than the striæ, depressed, concave in the middle, and ribbed by a number of cross-lines, fifteen to twenty between each striæ, and distinctly indented. The egg is contracted at the apex, the striæ protruding at the tip a little beyond the body of the egg. The eggs were deposited June 24th, and hatched in six or seven days. When fresh from the egg, the larvæ were about one-tenth of an inch long.

"*Larva* (young). Head medium-sized, black, and shining; the body above is dark brown, with transverse lines of a paler color, especially on the anterior segments; it is thickly covered with short hairs of a pale brownish color. Between the first and second moult it is one-fourth of an inch long. The head is bilobed, shining, black, and hairy, and the body above is greenish black, the greenish tinge most apparent on the second and third segments, with a few small yellowish dots along each side, and transverse rows of strongly elevated, black tubercles, emitting numerous short, black, hair-like spines. The under surface is similar to the upper; the feet are black and shining, and the prolegs are black, tipped with a paler hue. After the second moult, there are two fleshy tubercles on the second segment much longer than the others, which are covered throughout with small, hair-like spines. The yellowish spots along the sides of the body assume more of an orange tint, and there are one or two faint longitudinal streaks of the same color along the sides close to the under surface, and between the rows of large raised tubercles are many smaller ones, which are also black, and appear but slightly raised.

"*Larva* (full-grown). Head, slightly bilobed, black, shining, and covered with short, fine, black hairs. The body above is dark grayish-brown, beautifully spotted and dotted with deep, velvety black; the second segment has two long, fleshy horns, yellowish white at the base, black above, covered with minute, blackish, hair-like spines. The third and fourth segments have each four whitish spines, tipped with black, those on the sides placed on the anterior portion of the segment, those above, about the middle. All the other segments have six whitish spines, except the terminal one, which has four. All the spines have five branches, of a black or brownish-black color, and one about one-third the length of the fleshy horns on the second segment. A pale line extends along each side, from the fifth to the terminal segments, close to the under surface. The under side is brownish-black, darker on the anterior segments; feet black

and shining; prolegs brown, with a shining band of brownish-black on the outside."—W. SANDERS, in *Packard's Guide*, p. 254.

Chrysalis. This has two large, conical tubercles in front of the insertion of the antennæ, and two acute tubercles on the thorax. The thorax is acutely bi-tuberculated on the sides, with an acute thin dorsal ridge, on each side of which are two small, sharp tubercles. Along the back of the abdomen are two rows of tubercles, those on the third abdominal ring being much larger. It is half an inch long, pale ash, with black dots and irregular lines."—PACKARD, *loc. cit.*

Pyrameis Carya. Hubn.

Larva. On exclusion from egg, almost wholly black, with faint yellow irrorations. After the first moult, the head is black, shining, densely and rather coarsely punctured. Body black, transversely mottled with lemon yellow, with a black dorsal line, and lateral waved lines of yellow, enclosing the stigmata. Spines black, ramose, those of the dorsal region yellow at their base. With each succeeding moult, the black gradually disappears, and the yellow markings acquire a paler shade.

Mature Larva. Head, brownish-black, thickly covered with whitish hairs. Ground color of the body, pale greenish-yellow, mottled irregularly with black and olive patches, and with a broken, black, dorsal line. The spines of the first four segments are black, with white branches, the whole of the remaining spines being dull fawn-color, darkest at their bases, with concolorous branching hairs. The stigmata are yellowish-white, surrounded by a black ring, and enclosed in a waved, mottled, black and olive band, from which proceed some narrow, oblique branches, joining the base of the lateral series of spines. Under side olivaceous, dotted with yellow. Feet and prolegs pitchy, with chestnut hairs.

Length, 1.25 inch.

Food plants, various species of *Malvaceæ*.

Chrysalis. Rather short, fawn color, covered over the whole surface with black dashes and dots, darkest about the thorax. The head is truncate in front, with two small, angular protuberances beyond the eyes. Mesonotal process rather short, angular, directed backwards. There are also two rather acute angular processes at the sides of the thorax. Abdomen, with three raised points on each segment, palest at their apex. At the junction of the thorax with the abdomen, are two small, subcordate patches of pure white, resting on two other small white spots at the base of the abdomen. Wing cases fawn color, with a few black streaks, and a submarginal row of six minute white dots, edged with black. Antennæ plainly visible, with the articulations distinctly marked. There are no gold or silver marks whatever.

Length, 0.85 inch.

Changed to chrysalis, July 2d. Imago, July 24th.

Limenitis misippus. Fabr.

"Larva. Cylindrical. General color, whitish. Head, dull olive, with dense minute prickles, its vertex bifid and terminating in a pair of prickly cylindrical horns,

transversely arranged, and each about 0.03 inch long. Back, speckled and mottled with olive of different shades above the line of the spiracles, except joints 2 and 8, and upper part of 7 and 9, but with a continuous pure white line above the spiracles, beneath which white line, on the fourth to tenth joints, is a large olive patch, extending on joints 6-9 to the external tip of the prolegs. A pair of black, transversely arranged dorsal dots in the suture behind joint 2, and a less obvious lateral one above the second and fourth pair of prolegs, surmounting the lateral white line. Joints 3-7 and 9-11 with more or less shining, elevated, blue dots. On joint 2, a pair of prickly, cylindrical, black horns, transversely arranged, and 0.16 inch long. On joints 3, 10, and 11, a pair of large, dorsal tubercles, transversely arranged, each crowned by a little bunch of 8-12 robust prickles. On joint 5 a pair of similar tubercles, but still larger, of a yellowish color, and mamma-like. On joints 4, 6, 7, and 9, tubercles similar to those on joints 3, 10, and 11, but smaller. On joint 12, four black, prickly, dorsal horns, quadrangularly arranged, and each about 0.03 inch long. Spiracles and legs blackish."—*American Entomologist*, 1869, vol. I, p. 193.

Chrysalis. Russety, with the sides of the abdomen varied with white, and with a thin, prominent projection on the back.

This insect occurs sparingly in British Columbia, and in Oregon. I saw it flying at the Dalles in July, and found a specimen in the collection of Mr. Johnston, of Portland; so that the earlier stages may be sought for in those districts.

Limenitis Lorquini. Bois.

Larva. General color, olivaceous, shading abruptly into stone-drab in the middle of the dorsal region. Head, deeply furrowed in front, dark fawn-color, covered with small warts, with two protuberances on crown, very rough, the apex of all the warts paler than their base. Second segment, whitish, with olive tint, with three irregular longitudinal blotches of black, not extending into either of adjoining segments; stigmata of this segment large, black, with white center. Third segment, pale olivaceous, swollen into two lumps, from which proceed two horns, very rough and warty, brown in color, and in shape very like small branches of coral. Fourth segment, greenish white, blotched with olivaceous, with two small black spots in front of the center. This segment is produced into two swollen lumps, crowned with a stellar tubercle. The stigmata of three and four are whitish. Fifth segment, olivaceous, with darker patches, wrinkled transversely, with a number of minute metallic blue dots, scattered irregularly. Sixth segment, whitish olivaceous, swollen into two mammiform protuberances, with stellar tubercles on the apex, a greenish dorsal line, and a few metallic, bluish spots, scattered over the disc. Seventh segment, olivaceous, striped longitudinally with paler shades, bituberculated, and with a few metallic blue dots. Eighth segment, whitish, the olivaceous patch here only visible on the anterior portion of the sides, with a small, darker blotch, dorsally edged with two faint, dark lines. Ninth segment, whitish, with green tinge, a dark blotch at base, and two or three faint, blackish dashes. The olive lateral patch is wanting.

Tenth segment, whitish dorsally, olivaceous at the sides. In the white patch are some black waved lines, directed posteriorly, and in the olive parts of this segment are some four or five metallic blue dots. Eleventh and twelfth, exactly alike, olivaceous, with a few paler lines, and two stellar tubercles on each segment, between which are about five metallic blue dots. Thirteenth, olivaceous, with paler stripes, and a rough double tubercle on the anal extremity, brown, warty, similar in color to the head. The stigmata from 5-12 are black, with whitish center. Above them, on 7, 8, and 10, is a black, velvety, ovate spot, and beneath them, commencing at 5, and extending to anal extremity, is a milk-white, waved, lateral line. Under side of body, pale greenish-brown, palest near the junction of the segments. Feet, brownish, with black rings, and with some white bristles springing from their base. Abdominal legs brownish, with very minute white tubercles.

Length, 1.20 inch.

Food plant, willows, and occasionally on oak.

Changed to chrysalis, June 12th. Imago emerged, July 6th.

Thecla halesus. Bdv.

This magnificent insect, the most showy and the largest of our *Theclas*, is met with occasionally in several localities near San Francisco. The following brief description of its early stages is appended:

"*Larva*. Green, slightly pubescent. Head and scaly feet testaceous. On the back there is a small ray, and on the sides, nine oblique bands of obscure green. At the base of the feet, a marginal ray of greenish yellow. Feeds on *Quercus*.

"*Chrysalis*. Russety, pointed with brown."—BOISDUVAL.

Thecla arsace. Bois.

"*Larva*. Reddish; back, white from the second to the ninth ring, and divided by two parallel, interrupted lines of obscure green. Near the base of the feet, there is a marginal ray of the same color, bordered with white below, and between that and the dorsal rays, a row of seven or eight oblique streaks.

"*Chrysalis*. Reddish before, and the wing envelopes greenish."—BOISDUVAL.

Found, though rarely, in Vancouver Island.

Thecla mopsus. Hubn.

"*Larva*. Greenish, with the back a little more whitish. The anterior and dorsal part has a brown quadrangular space, bifid behind, and marked with four white spots. The three hind rings have a wide white border, edged with brown. Head and feet brownish. Feeds on *Eupatorium coelestinum*.

"*Chrysalis*. Grayish-brown, with a row of yellow, ferruginous points on the sides."—BOISDUVAL.

Found sparingly near Portland, Oregon; at the Dalles, and on Vancouver Island.

LIST OF SPECIES NOTICED IN THIS PAPER.

<i>Papilio Daunus</i>	Chrysalis.
<i>Pieris protodice</i>	Larva and Chrysalis.
<i>Anthocaris ausoniedes</i>	" "
<i>Colias coesonia</i>	Larva.
<i>Terias lisa</i>	"
" <i>delia</i>	"
<i>Danaïs Berenice</i>	Larva and Chrysalis.
<i>Agraulis Vanilla</i>	" "
<i>Pyrameis Carya</i>	" "
<i>Limenitis Misippus</i>	" "
<i>Limenitis Lorquini</i>	Larva.
<i>Thecla halesus</i>	"
" <i>arsace</i>	"
" <i>mopsus</i>	"

From the Proceedings of the California Academy of Sciences, July 20th, 1874.

**Pacific Coast Lepidoptera, No. 6.—Notes on the Earlier Stages of
Ctenucha Multifaria, Boisduval.**

BY HENRY EDWARDS.

Through the kindness of Dr. Blake, of this Academy, I have an opportunity to call attention to the earlier stages of one of our rarer day-flying moths, (*Ctenucha multifaria*) the transformations of which were previously quite unknown. Dr. Blake captured a female recently at Crystal Springs, San Mateo County, in the act of depositing her eggs upon the leaves of the snow berry (*Symphoricarpus racemosus*. Michx). The caterpillar may therefore hereafter be sought for upon that plant.

Egg. Spherical above, much flattened at base, dull cream white, slightly glossy. Attached to the upper surface of the leaf, and deposited separately, in this respect differing from the species known in the Atlantic States as *Ctenucha virginica*, the eggs of the latter being found in small clusters, adhering compactly together. The young caterpillars emerged from the egg in about twelve days, and presented the following appearance :

Head, rather large, pale chestnut brown. Body, dull cream white, with numerous concolorous hairs, those of the extremities being the largest. Along the head in front is a faint, slightly waved black line. Each segment is provided with a row of black dots, about four to each segment, becoming fainter towards the posterior extremity.

Though supplied constantly with fresh food, and watched with every care, I regret to say that my young larva all died within a week, so that the mature caterpillar of this interesting insect still remains unknown ; but during a recent visit to Monterey, I found adhering to the trunk of a pine tree a singularly formed cocoon, so remarkable in its construction as to cause me to watch for the emergence of the perfect insect with considerable interest. I had the satisfaction in a few days of discovering that it was the present species, and have pleasure in appending the following description :

Chrysalis. Tubular, slightly thickened about the anterior portion of the thorax. Shining, pitchy, with a double line on the thorax, some streaks on the wing cases, the antennæ, mouth parts, and the base of each abdominal segment, bright chestnut color. A few very short hairs are scattered about the upper side of the abdomen.

Length, 0.75 inch.

The cocoon was formed of rather long hairs, pale fawn color, sparsely mingled with black, which appear to rest on each other, and to be irregularly placed. The upper portion was drawn up into a pointed ridge and gable-shaped, like the roof of a house, while the base was spread out, and attached very loosely to the trunk of the tree, compelling me to cut away a piece of the bark in order to secure the cocoon. The structure of the chrysalis case of this genus appears to be peculiar. According to Dr. A. S. Packard, "it is formed out of the hairs of the caterpillar, without any silken threads being employed, as far as could be observed by microscopical examination. The hairs of these insects are thickly armed with minute spinules, so that by being placed next to each other, they readily adhere together, no silk being spun throughout the entire operation."

This insect, which is at present rare in collections, is found in its perfect state among reeds in rather marshy districts, and may be known by its bright bluish black color, with crimson marks on the head and thorax. Unless in very hot sunshine, it is a remarkably sluggish insect, and feigns death when captured.

A still scarcer, but closely allied species, described by me in these Transactions as *Ctenucha Walsinghamii*, was taken by Lord Walsingham some three years since in Southern Oregon. I have now to record the capture of two other specimens of this rare insect by Mrs. Howard Coit, in Napa County, and by her kindly added to my collection. This indicates rather a wider range than belongs to most members of the genus, as they appear from our present knowledge of them to be remarkably local.

From the Proceedings of the California Academy of Sciences, September 7th, 1874.

Pacific Coast Lepidoptera, No. 7.—Descriptions of some New
Species of Heterocera.

BY HENRY EDWARDS.

Fam. EPIALIDÆ. H. S.

Epialus Tacomæ. Hy. Edw. n. sp.

Head, thorax, abdomen, and wings wholly reddish-brown, darkest upon the thorax and along the costa.

Primaries, with a double oblique row of white spots, narrowly edged with black, forming two interrupted bands. The basal one is the shortest, and is composed of oblong spots divided by the nervures. The outer reaches from the median nerve to the interior angle, where it is broadest. There is a faint white dot between these rows of spots, and traces of some dull yellow blotches toward the apex.

Secondaries, slightly transparent, with the fringes and costal margin brighter than the disc of the wing.

Underside, with the rows of white spots only faintly visible. The costal margin of the primaries is marked with dull yellow blotches, and the whole of the fringes bright reddish-brown.

Exp. of wing, 1.60 inch.

Length of body, 0.65 inch.

Taken at Tacoma, Washington Territory, by Mr. Jas. Behrens. Coll. Hy. Edw.

Nearly allied to *Ep. Mathewi*, Hy. Edw., but the markings more closely resemble those of the European *H. sylvinus*.

Fam. ARCHIDÆ. B.

Halesidota Davisii. Hy. Edw. n. sp.

Head, collar, and patagia cream yellow, the latter fringed internally with grayish-blue, forming a double line upon the thorax. Thorax and abdomen dark buff, the latter deepest posteriorly, white at the sides, with five oblong black spots. Anal segment brown.

Primaries, semi-transparent, cream-color, with a series of five orange blotches along the costa, oblong in shape, edged narrowly with black, and divided by the subcostal nervure. The two nearest the base are connected interiorly by some

lines of black, arranged triangularly, the side of the triangle joining the two orange spots, and the apex directed towards the base of the wing. The third spot is small, almost square, and divided by a black line. The fourth is the largest, oblong, joining a bent orange line, which rests on a small triangular mark, behind which is a straight and rather narrow orange patch. The fifth spot is the smallest, almost triangular in form, with a small ovate patch beneath it. The whole of these orange spots are narrowly edged with black. On the disc is a small ring, formed by a black line, and two others, nearly the same shape, on the interior margin. Posterior margin edged with pale buff, most broadly towards the apex. This mark is enclosed in a narrow black line.

Secondaries, very pale buff, hyaline, slightly opalescent. Hairs of the anal angle, deep buff. Fringes of both wings, cream-color.

Antennæ, chestnut. Palpi, deep buff, with the terminal article black. Feet and legs buff, banded with black. Under side of the abdomen, pale cream-color. The markings of the upper side of the wings are seen very clearly beneath.

Exp. of wings, 2.20 inch.

Length of body, 0.85 inch.

Prescott, Arizona. Dr. Davis, U. S. A., to whom I have great pleasure in dedicating this delicate species.

Fam. NOTODONTIDÆ. B.

Heterocampa (?) *conspecta*. Hy. Edw. n. sp.

Head very small, iron-gray. Thorax cinereous, with a waved brown streak in front. Patagia also edged internally with brown. Abdomen long, extending a considerable distance beyond the wings, stone-drab, with a brown shade at the base, and with short, distinct tufts of darker hairs from the sides of the third, fourth, and fifth segments.

Primaries, cinereous at their base, with a slight purplish-red tint, and a brown basal streak, edged interiorly with black. On the disc is a black, semi-lunate streak; behind this, a patch of silver-gray, extending along the costa to the apex, and there enclosing a double black dash. The posterior margin is broadly buff towards the apex, with some black and brown dashes irregularly placed. The buff patch, (which is somewhat similar in form to that of the European *Pygara bucephala*) shades into brown on the interior angle, and is enclosed by a black line, notched exteriorly, straight for the greatest portion of its length, but bent inwardly on the costa, and not quite reaching the interior margin, which has a narrow streak of pale fawn-color running its whole length. Fringes, fawn-color, intersected with brown. Secondaries, pale drab, with a brownish shade near the costa and the anal angle, and a faint brown medium band. Fringe, whitish.

Antennæ, chestnut-brown, not pectinate to the tip. Palpi, very short, blackish-gray. Tibiæ densely clothed with hairs. Tarsi, rather long and slender.

Under side. Primaries dirty white, with blackish median cloud, widest on the

costa, and extending to the base; some dashes of same color on the margins. Secondaries, whitish, glossy; costa and anal angle with blackish patches.

Exp. of wings, 1.35 inch.

Length of body, 0.80 inch.

Napa County, Cal. June. Taken at light.

I have placed this beautiful insect provisionally in *Heterocampa*, at the suggestion of my friend, Mr. Stretch; though it may prove to be the type of a new genus.

NOTE.—I wish to correct an error into which I have been unintentionally led in No. 4 of these papers (Proc. Cal. Acad. Sci., Feb., 1874). I have therein described, as a new species, *Spilosoma pteridis*. Closer investigation by Mr. Stretch and myself convinces us that we have to deal with the second species of *Antarctia*, noticed by Boisduval; but as Mr. Stretch had previously arrived at the conclusion that *A. vagans*, Bdv., *A. rufula*, Bdv., and *A. punctata*, Pack., were all one species, and referred only to varieties of our common Californian form, I was led to believe that my species from Vancouver Island was undescribed. It is now, however, established beyond a doubt, both from a careful examination of the caterpillar and the perfect insect, that we have two distinct species of *Antarctia* already known from our Coast, which have been described by Dr. Boisduval as *Ant. vagans*, and *Ant. rufula*, and that my *Spilos. pteridis* belongs to the former species. The synonymy will therefore stand thus:

1. *Antarctia vagans*, Bois., Northern California.

Spilosoma pteridis, Hy. Edw., Vancouver Island.

2. *Antarctia rufula*, Bois.

Antarctia punctata, Packard, San Francisco district.

I trust that the description of the caterpillar and chrysalis, which I have appended to my notice of *Spilosoma pteridis*, will be sufficient apology for my having unwittingly encumbered the synonymy of the genus.

From the Proceedings of the California Academy of Sciences, September 7th, 1874.

Pacific Coast Lepidoptera, No. 8.—On the Transformations of some species of Heterocera, not previously described.

BY HENRY EDWARDS.

Fam. ZYGÆNIDÆ.

Phryganidea Californica. Packard.

Egg. Spherical, a little flattened above, shining, yellowish white at exclusion—attached in clusters of about ten or twelve to the upper side of the leaves. The third day the apex of the egg assumes a dull orange hue, afterwards changing to a bright reddish purple, and gradually to a duller shade as the young larva emerge. The eggs were laid by a ♀ in my possession, on July 5th. All (about twenty-five specimens) emerged almost simultaneously.

Young larva. Head very large, almost monstrous, pale olive brown, with narrow black line at the base. Body pale canary yellow, with four rows of black spots arranged longitudinally in lines.

The mature form of the larva is noticed in Stretch's "Zygœnidæ and Bombycidæ of North America," but I subjoin the description of one of the many varieties to which it is subject, believing that all information with reference to this species (the position of which in classification has not yet been settled by entomologists) will prove to be of value :

Yellowish-white, shining, head large, round, stone color, with black point on each side of the mouth, a median stripe of reddish brown, and a narrow one of same color on each side. A broad black stripe extends laterally across the second segment at base of the head, and another across the thirteenth segment, which also contains a broken black dorsal line. In the middle of the black lateral stripes is a waved whitish line, enclosing a narrow black one. At the base of the abdominal legs is a waved interrupted yellow line, edged narrowly with black.

Under side yellowish-white, faintly marked with broken brown waved lines; feet pinkish, striped with black; abdominal legs, yellowish-white.

Fam. BOMBYCIDÆ.

Chisocampa constricta. Stretch. n. sp.

Head, slate-gray, with black spots; mouth parts, black, tipped with dull yellow. Body, slate-gray, covered laterally with black irrorationes. Along the

middle of the dorsal region is an irregular black stripe, marked on its sides with waved orange lines, and surmounted at the union of the segments by a double tuft of chestnut-brown hairs. On the second and third segment, in the middle of the notched black line, is a stripe of dull white. From the base of the orange brown-tufts spring a few scattered black hairs, longest anteriorly, and from the forepart of each segment arise lateral tufts of white hairs. The stigmata are orange, with black central points. Above the base of the feet is a black interrupted line, out of which spring other white hairs, irregularly disposed. Under side, dull, velvety black, with the anterior portion of each segment whitish. Feet and prolegs black, yellow at their tips. Length, 1.85 inch. Food plant, *Quercus Sonomensis*. Benth.

The larva is frequently attacked by a species of *Ichneumon*, the eggs of which are visible on the head and anterior segments.

Chrysalis. Chestnut-brown, with few hairs along the base of each segment.

Cocoon. Ovo-lanceolate, very silky, yellowish-white, with some portions glued in compact mass, and whiter than the remainder. Chrysalis only imperfectly seen through the web.

Larva, May 22d; changed to chrysalis, May 29th. Imago, June 16th.

Leucarctia acrea. Drury.

Young larva, previous to last moult. Black, with yellow patches, irregular in form, along the sides and at the base of the segments, each of which is provided with seven flesh-colored tubercles, from which spring whitish or stone-colored hairs, sparsely intermingled with black. The hairs of the dorsal region are nearly white. Head, black, shining, with broad yellow stripe in center. Feet, black; abdominal legs, flesh-color, banded with black.

Halesidota sobrina. Stretch.

Larva. Head, rough, deep dull black. Body, velvety black, slightly shining. In the center of each segment, from five to twelve, inclusive, is a raised triangular tuft of rich, velvety black hairs. At the base of these is a double row of tubercles, from which spring radiating spines arranged in circular form, those nearest to the center being bright lemon-yellow, while outwardly they are fawn-drab. Laterally, there is another series of double tubercles, with spines still arranged in circular form, and entirely fawn-color. From the fourth and tenth segments spring two bunches of long black hairs, directed outwardly and anteriorly, like those of the genus *Orgyia*. The yellow spines of the interior dorsal tubercles give the appearance of a rich yellow dorsal line.

Under side, dull black; feet, black; abdominal legs, yellowish, banded with black. Length, 1.70 inch.

Food plant, *Pinus insignis*, Douglas, (Monterey pine).

Larva taken at Monterey May 31st; changed to chrysalis, June 4th—9th. Imago appeared June 16th—20th.

Chrysalis. Bright chestnut-brown, palest towards the head, enclosed in thin web composed of hairs of the larva, through which the chrysalis is indis-

tinctly seen. The transformation is effected under bark of decaying pine trees, and beneath logs.

Halesidota argentata. Pack.

Larva. Precisely similar in size and form to that of *H. Sobrina*, but differing considerably in color. Body, bluish-black, slightly shining. Each segment, from five to twelve inclusive, is provided with tuft of velvety black hairs, as in the last species, while the fourth and tenth are armed with long bunches of black hairs, those of the tenth being decidedly shorter than in *H. Sobrina*. The stellar pencils of the sides are very dark chestnut-brown, instead of stone color, while the yellow spines, which give so bright an appearance to that species, are here only very faintly seen. Under side, dull brown; feet and prolegs with fleshy tinge. Length, 1.70 inch.

Big trees, Calaveras County, June 19th.

Taken on bark of *Pinus ponderosa*, Dougl., (Yellow pine) and *Pinus Lambertiana*, Dougl., (Sugar pine). Crawling restlessly about, and eating little or no food after capture. In five or six days the seven specimens taken spun a thin web similar to *H. Sobrina*, but very much darker in color. The chrysalis itself is, however, paler than its ally, being in all cases the very lightest shade of chestnut. Three of my specimens were attacked by *Ichneumon*. The remainder gave 1 ♂, 3 ♀. It is a source of extreme pleasure to me to be able to prove the distinctness, as species, of *H. Sobrina* and *H. Argentata*, as the fact was one which occasioned considerable doubt to my friend, Mr. Stretch, and myself. My larvæ from Monterey gave undoubted *H. Sobrina*, agreeing in nearly every respect with Mr. Stretch's figure and description. The only point of difference is the color of the abdomen, which is represented by Mr. Stretch as brown. Now, the only specimen known to Mr. S., which was taken by the late M. Lorquin, was very old, and the abdomen may have become greasy or stained from the ravages of time. The antennæ were, I think, also destroyed. In all other characters my specimens agree exactly with the plate and text in the "Bombycidae of North America." As to *H. Argentata*, there can be little or no doubt. The species has long been known, and the caterpillar was found by me in the Yosemite Valley some years ago. I have also seen it on different occasions at Lake Tahoe, the Dalles, Oregon, and in Vancouver Island, though I have never succeeded in rearing it until the present instance. *H. Sobrina* would appear to be a much more rare and local species than its nearest ally.

Pyrrehartia Isabella. Packard.

Larva. Head black, with the mandibles and mouth parts generally yellowish-white. Body, entirely slaty-black. Spines, very long, arranged in spreading bunches from tubercles. Those of the four anterior segments black, the fifth, sixth, seventh, and eighth bright chestnut-brown, with a few scattered black hairs, while the remainder are black, similar to those anteriorly. Feet, dirty white. Length, 1.25 inch.

Chrysalis. Enclosed in cocoon spun from hairs of caterpillar, those of the anterior segments being so mixed with the others as to give an uniform color of dark-brown.

Changed to chrysalis, July 15th. Imago, August 11th.

Mr. Stretch has raised what appears to be this species from a larva of an "uniform grayish-brown." Does this fact not serve to indicate that *P. Isabella*, Pack., and *P. Californica*, Pack., may be distinct species after all?

Platysamia ceanothi. Behr.

Larva. Pale apple-green, of a very vivid tint throughout, with a slight whitish bloom over the whole surface. Head, with some purplish-black streaks in front and at the sides. Mouth parts, pale-green, pitchy internally. Second segment with four minute black dots, edged with white anteriorly, and two very small white mammiform tubercles on the sides. Third, fourth, and fifth segments, with long raised protuberances, pale yellow, with a black, swollen band in the middle, and each surmounted by six blackish spines. The third segment has also four lateral raised white spots. The fourth and fifth segments have two mammiform white spots, the lateral ones on these segments becoming merely black points. On the sixth segment is a faint white raised spot, in the same position as the white swollen tubercles on the preceding segments. Seventh and eighth, with only black points laterally. Ninth, tenth, and eleventh, without any trace of spots. Twelfth segment bears in the middle a long, raised protuberance, yellow, banded with black, exactly similar to those of three, four, and five. On this segment there are also two lateral points, white, tipped with black. Anal segment with four black dots arranged in a square, and two white and black points as in twelve. Stigmata white, edged anteriorly with black. Below the stigmata, and parallel with them, is a row of very minute black dots, edged with greenish-white. Feet, yellowish-green, with the tips purplish-black. Abdominal legs, greenish-yellow, with the edges purplish-black. Viewed from behind, the anal segment is yellowish-green.

Length, 3.30 inch.

Width, anter. 0.60 inch; post. 0.40 inch.

Food plants, *Ceanothus thyrsiflorus*, Esch.; *Frangula Californica*, Gray; *Rhamnus croceus*, Nutt; *Alnus viridis*, D. C.

When about to undergo its change, the caterpillar attaches itself usually to the under side of a twig, and spins a rather coarse and very compact outer case, with which no leaves or other extraneous substances are incorporated, and within this a reddish-brown cocoon, the filaments of which are strong, rather coarse, but glossy. The cocoon and its outer case are oval, produced into a cone at the end, by which the insect escapes.

Chrysalis. Pitchy, almost black, very short, rounded in front, and much swollen about the abdominal region. Segments rough, and transversely wrinkled.

Length, 1.15 inch.

The caterpillar changes to a chrysalis in September, and the imago appears in the following May or June. This beautiful insect was once remarkably common around the Bay of San Francisco, but the march of improvement has destroyed most of its haunts, and it must now be regarded as one of our really rare species.

Gastropacha. sp.

In August, 1873, I found, in Vancouver Island, a cocoon which I did not recognize, and was surprised at finding that it produced, in April last, a beautiful insect of this genus. Mr. Stretch believes the species to be identical with the European *G. betulifolia*; but as I am not familiar with the transformations of that species, I append the following:

Chrysalis. Black, covered with a dense woolly substance, powdered with a fine dust, and enclosed in a very soft, woolly cocoon, formed, apparently, of very fine silk, with which a few yellowish-brown hairs are intermingled. The cocoon is placed in the angle of a frond of *Pteris*, the frondlets being drawn together at the edges as a covering.

Larva. Some days after the finding of the above-mentioned chrysalis, I discovered a larva at the base of an oak tree, which spun a cocoon precisely similar to that previously described, and I therefore believe it to be the same species; but as the perfect insect has not yet made its appearance, I give a description of the caterpillar, without further reference to its identity:

Black, very minutely spotted with white, each segment with a broad, white, transverse band, slightly triangular dorsally, with the apex of the angle directed anteriorly. The four anterior segments have a number of chestnut-colored hairs, irregularly placed, and on the three anterior segments are a series of red spots. Head pitchy, rather large, shining. Feet and abdominal legs pitchy, blackish towards their base.

Length, 1.10 inch.

The caterpillar spun a very soft, silky web, with some fragments of oak leaves attached, entirely concealing itself from view.

Fam. GEOMETRIDÆ.

Charodes agrotata. Packard.

Larva. Varying very much in color, but usually greenish-white with a fleshy tinge, the five anterior segments with a darker cloud. Head with four ovate, blackish-brown marks, two on the sides, and two in front. Second segment with two black spots near the base, above which are some faint yellow dashes. Segments 3 to 7, inclusive, with faint brownish streaks, running longitudinally. Rest immaculate, except the anal, which has four minute black dots. An interrupted, waved, blackish lateral line encloses the stigmata, which are bright orange. Feet and abdominal legs, dull greenish-white, with the claws blackish. Anal feet with a black streak posteriorly.

Length, 1.10 inch.

When fully grown, the caterpillar draws two leaves together, and spins a stout, clear, white, silky web, similar to many *Bombycidae*, in which to undergo its change. It is remarkably destructive to many garden plants, particularly to ivy, ferns, various species of *Pelargonium*, and the pepper tree (*Schinus Molle*). It is not unusual to see large plants utterly destroyed by their attacks, and the species may be regarded as one of the most troublesome pests with which the floriculturist has to deal. Changes to chrysalis in August and September, and the moth appears in about twenty days.

Chrysalis. Smooth, greenish-white. Eyes, visible pale-brown, sometimes black. Antennae, distinctly marked, bright chestnut-brown. Length, 0.75 inch.

LIST OF SPECIES NOTICED.

<i>Phryganidea Californica</i> , Pack.....	Egg and Larva.
<i>Chistiocampa constricta</i> , Stretch.....	Larva and Chrysalis.
<i>Leucartia acraea</i> , Dewey.....	Young Larva.
<i>Halesidota sobrina</i> , Stretch.....	Larva and Chrysalis.
" <i>argentata</i> , Pack.....	" " "
<i>Pyrharractia Isabella</i> , ".....	" " "
<i>Platysamia ceonothi</i> , Behr.....	" " "
<i>Gastropacha</i> , sp.....	Chrysalis.
<i>Charodes agrotata</i> , Pack.....	Larva and Chrysalis.

From the Proceedings of the California Academy of Sciences, November 2d, 1874.

Pacific Coast Lepidoptera, No. 9. — Description of a New Species of *Thyris*, from the Collection of Dr. Hermann Behr.

BY HENRY EDWARDS.

Through the kindness of my friend Dr. H. Behr, I am enabled to present the following descriptions of a new species of this very interesting group of insects, examples of which are contained in his collection.

The genus *Thyris*, though of wide geographical distribution, contains but few forms, and perhaps not more than five species are yet known to science. Of these, two are found in Europe, one in India, and two in the United States. The species now noted approaches very closely in coloration to the European forms, but is in many respects abundantly distinct.

Thyris montana. Hy. Edw. n. sp.

Head and thorax, light brown, with yellow reflection. Antennæ, palpi, and tongue, chestnut. Abdomen, yellowish brown, very glossy.

Primaries, tawny, palest at their base, with four waved brownish bands, the two basal narrow and very irregular in form, third broadest, notched inwardly, and spreading out to its greatest width on costa, where it incloses a small triangular yellow patch. Submarginal band, almost equal. On the disc is a minute, subovate, vitreous spot. Fringes, yellowish brown.

Secondaries, tawny, with brownish blotches. In center of the wing is a large-vitreous patch, seemingly two oblong patches joined together. Fringes, yellowish brown. Underside, same as the upper, with the brown markings a little darker and the vitreous patches less distinct. Size of *T. lugubris*.

Rocky Mountains, Colorado. Two ♂ in collection of Dr. H. Behr.

Nearly allied to *T. fenestrata* of Europe, but differing by its paler color, and by the smaller size of the vitreous spots.

Specimens of *Thyris maculata*, Harris, are also to be found in Dr. Behr's collection, taken in the same locality as *T. montana*.

1891. The first of these was the publication of a book
by the same author, entitled "The History of the German
Language".

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author, entitled "The History of the German Language".
The twentieth was the publication of a book by the same
author, entitled "The History of the German Language".

From the Proceedings of the California Academy of Sciences, December 7th, 1874.

Pacific Coast Lepidoptera, No. 10.—On a New Species of *Papilio* from California.

BY HENRY EDWARDS.

The species of *Papilio* composing the group of which *P. Asterias* and *P. zolicaon* are the best known forms, appear to have obtained their largest representation on the Pacific Coast, as the whole of those known to science, with the exception of *P. Bairdii*, from Texas, are found more or less abundantly from Alaska to the shores of the Gulf of California. That these insects are apt to run into varieties there can be but little doubt, and it has not been without some misgivings that I have ventured to add another to the list. I have, however, carefully studied all the examples in my collection, and can only arrive at the conclusion that I am justified in describing the following as a distinct species :

Papilio Pergamus. Hy. Edw. nov. sp.

♂. Antennæ and head dull black. Thorax, black, with the patagiæ rather dark yellow, orange anteriorly. Abdomen black, with a yellow lateral stripe, becoming obsolete towards the base. Feet and legs entirely black.

Primaries. Rich velvety black, as in *Asterias*. A row of eight cream-yellow sub-marginal spots, of which the one nearest the apex is the largest, and almost round. The second is also nearly round, the remainder becoming somewhat lunate, the last produced into a point posteriorly. The macular band is composed of eight spots, the smallest nearest the costa, and gradually increasing in width to the interior margin. The first spot is oblong, the next five are angular, the seventh is in the form of a parallelogram, and the eighth is a longitudinal streak. Within this band, and closely approaching the costa, is a small angular patch, and a very few yellow scales are visible in the middle of the discal cell, and near the base of the wing. Fringes black, with indistinct white patches between the nervules.

Secondaries. The macular band is wider than is usual in *Asterias*, and perfectly straight on its inner edge, so that when the wings are spread, the band of both wings presents a nearly uninterrupted straight line from the costal nervure of the primaries to the anal margin of the secondaries. The first two spots near the costal margin of secondaries are almost square, slightly notched exteriorly. The third is oblong, divided by the discal nervule. Spots four and five are somewhat angular, produced a little outwardly, thus destroying what would otherwise be a perfectly straight band. The sixth spot is almost a parallelogram, and the seventh is nearly lunate. The submarginal spots are five in number, the first near the costa a mere dot, the second almost oval, and the other three lunate. Margins of the wing broadly notched, emarginations yellow. Tails, wholly black, as long as in *Asterias*, but slightly narrower. Anal spot, large, black, with iris fulvous anteriorly, yellow posteriorly. Between the macular band and the submarginal spots are some bluish scales, becoming, as in all allied species, quite obsolete towards the costa, the most distinct being that which surmounts the anal ocellus.

Underside. Similar to the upper, except that the black is duller and less velvety, and the whole of the spots less yellow in color. The blue scales are more regularly defined, and approach the costa, where they are joined by the first submarginal spot, which is here bright fulvous.

Expanse of wings, 3.20 inch.

Length of abdomen, 1.25 inch.

This beautiful insect is closely allied to *P. Indra*, Reakt., but differs from that species by the greater width of the band of the secondaries, by the black anal ocellus simply surmounted with fulvous, and by the length of the tail, which, in *P. Indra*, is spoken of by both Messrs. Reakirt and Strecker as a mere tooth. In Mr. Strecker's drawing of the species, it is represented as shorter than that of *P. brevicauda*, whereas in the present species the tail is quite as long (though perhaps a little narrower) as that of *P. Asterias*. In a ♂ specimen of *P. Indra*, which I received from the high Sierra of Tuolumne County, there is also a decided yellow line on the outer edge of the discal cell, which is nowhere visible in *P. Pergamus*. The latter is also a little larger in size. I am indebted for this most interesting addition to our insect fauna to the late G. R. Crotch, who took one specimen in excellent condition near Santa Barbara, in May, 1873.

I am inclined to believe that *P. Aliaska*, Scud., is identical with *P. Hippocrates*, Feld., from Japan, as between some specimens of the latter in my cabinet, and one of *P. Aliaska*, taken by myself at the Dalles, Oregon, I can perceive no difference whatever. *P. Hippocrates* is stated by Kirby, and other European entomologists, to be only a variety of the European *P. Machon*. This appears to me to be an error, as in a long series of each the points of variation are quite easily distinguished, the shape of the lower wings being a permanent character. They appear to bear the same relation to each other as do *P. Turnus* and *P. Rutulus*. I have little doubt that *P. Asterioides*, Reakt., is the tropical form of *P. Asterias*, Cram.

The species may be thus tabulated :

A.

Macular band of secondaries extending to the base of the wing.

1. Band of primaries narrow on internal margin. Abdomen spotted *P. Zolicaon*.
2. Band of primaries very wide on internal margin; abdomen with yellow lateral line. *P. Aliaska*.

B.

Macular band of secondaries narrow. Base of wing black.

a. Band bent inwardly on secondaries. Abdomen spotted.

1. Tails very short *P. brevicauda*.
2. Tails long, band of secondaries narrow, fulvous beneath. *P. Asterias*.
3. Tails moderate, band of secondaries broad, particularly at anterior margin; underside without fulvous spots. *P. Bairdii*

b. Macular band perfectly straight on inner edge. Abdomen with yellow lateral line.

4. Tails very short. *P. Indra*.
5. Tails long. *P. Pergamus*.

I have derived the specific name from Virgil's "Æneid," thus translated by Dryden :

"With eager haste a rising town I frame,
Which from the Trojan Pergamus I name."

—*Æneid, Book III.*

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From the Proceedings of the California Academy of Sciences, April 19, 1875.

Pacific Coast Lepidoptera, No. 11.—List of the Sphingidæ of California and adjacent Districts, with Descriptions of New Species.

BY HENRY EDWARDS.

As the value of local lists is fully recognized by entomologists, I propose, in the present paper, to furnish a complete catalogue of the species of this interesting group of Lepidoptera, as far as known to me to inhabit the Pacific Coast, and to offer descriptions of what appear to me to be forms as yet unrecognized by science. The number of species, compared with those of the Eastern States, is but small, but extended exploration of our little known mountains and valleys may furnish us with others, while it is more than probable that many of those from Northern Mexico may yet be found within our borders; and, acting upon this belief, I have introduced the description of an exquisite species from the region of the Sierra Madre, which may some day have to be included in our lists. I have followed the arrangement proposed by Messrs. Grote and Robinson in their catalogue of Lepidoptera, (No. 1, Am. Entom. Soc., 1868) and have invariably adopted the generic terms of those authors. The notices of the habits and localities of the species are from my own observation, and for them I am personally responsible.

Tribe MACROGLOSSINI.

Arctonotus lucidus. Bdv.

Head, palpi, antennæ, thorax, and abdomen, yellowish olive. Thorax, with the tegulæ a little darker, and edged narrowly with white. Abdomen, with small anal tuft. Anterior wings, yellowish olive, with a darker median band, not reaching the interior margin, and surrounded by an oblique rich purple border along the interior margin, and obsolete before reaching the costa. This border has a rather brilliant metallic reflection. Beyond the middle is a notched shade of olive, resting on the costa, a small linear patch near the apex, and a lunate streak near the interior angle, of the same color. Fringe of the exterior margin, yellowish, with the edges brown; that of the internal margin, purplish, concolorous with the oblique band. Posterior wings, reddish fawn color at the base, with a rich claret-red submarginal band, narrowing inwardly, and lost in the brown hairs of the anal angle. Margin, broadly reddish fawn color, the same shade as the base of the wings. Under side, gray-

ish olive, with a ferruginous patch on disc of the anterior wings. Fringes, deep fawn color. Middle tibiae, with four black, shining, palmated spines, recalling somewhat the structure of the fore tarsi of *Gryllotalpa*. Hind pair, with two spines, fawn color, clothed with hair.

Expanse of wings, 2.00 inch.

Length of body, 1.00 inch.

Coll. Dr. Behr, Sacramento. H. E., Oregon.

I have taken the liberty to redescribe this very rare *Sphinx*, as Dr. Boisduval's description is both brief and vague, and as I have had the good fortune, recently, to examine six specimens of this little known insect, which were forwarded to me from the Dalles, Oregon, for the most part in excellent condition. At present, this is certainly one of the rarest species known to American entomologists. I have followed Mr. Grote in placing this genus in the present group, though not without misgivings, as its general structure, particularly the form of its antennae, its long body clothing, and its extremely short tongue, seem, as Clemens observes, to point out its proximity to the *Bombycidae*. It has been placed by this author, and by Walker, at the extreme end of the *Sphingidae*.

Hemaris Thetis. Bdv.

Through the kindness of my friend, Mr. Grote, I have recently had the opportunity of examining Boisduval's type specimens of this species, the former gentleman's admirable description (Trans. Am. Ent. Soc., Vol. 1, 1868) rendering further notice of it unnecessary. I should, however, observe, that in fresh specimens there is always present on the hind tibiae a bunch of long, pale yellow hairs, which are not visible in the somewhat worn and faded type specimens. The presence of the reddish apical spot in the anterior wings is, I think, by no means a safe character, as in one of my specimens it is quite apparent, while in two others it is entirely absent. This species may, however, be always known by the thoracic and abdominal clothing, which is invariably dull olivaceous, with a brownish tinge, and is extended without any break to the yellow pre-anal segments. *H. Thetis* is found in the valleys of California, chiefly in the neighborhood of the Coast Range, and may be sought for, in May and June, in Napa, Sonoma, and Marin Counties. It is especially attached to the flowers of various species of *Lupinus*.

Coll. H. E., (exactly agreeing with Boisduval's type) Dr. Behr, *et al.*

Hemaris rubens, n. sp. (?) Hy. Edw.

Under this name, if a true species, I wish to recognize two specimens, in my collection, in which the apical red mark is very distinct above and below, the oblique scale patch at the base of the primaries reddish, and the costa and margins of the wings on the lower side also with a decided reddish hue. In *H. Thetis*, the two pre-anal segments alone are yellowish, but in the two specimens referred to above, the yellow is carried on to the third segment, dorsally and beneath, but is interrupted on the sides by a black band. This appears to me to be a strong character, as in my examples of *Thetis* the yellow shade is distinctly confined to the two pre-anal segments. Slightly smaller than *Thetis*. The tuft of yellow hairs on the hind tibiae is present in this species.

Oregon, Lord Walsingham. Lake Tahoe, Cal., Mrs. Hy. Edwards. Coll. H. E.

Hemaris cynoglossum, n. sp. Hy. Edw.

Size of *H. Thetis*. Head above, pale yellowish olive; eyes, margined behind with white scales. Palpi, pale yellowish, with the terminal joint tipped with black. Thorax above, bright greenish olive, without the brown tint observable in *Thetis*. Basal segments of abdomen, rich velvety black. Two pre-anal segments, pale yellowish, with a darker median shade. The under side of abdomen, including the anal tuft, is wholly black, except the edges of the pre-anal segments, which are pale lemon yellow. The thorax is less covered beneath with yellow hairs than in *Thetis*, and the pale scales are hardly visible at the base of the wings, while the tufts of yellow hairs on the tibiae, so eminently characteristic of *Thetis*, are here wholly wanting. The wings above and below are similar to the allied species, but are decidedly more opalescent, giving out a most beautiful bluish reflection. Antennae, blue black. The fore wings are a little sharper at the apex than those of *Thetis*.

Two ♂, two ♀, Coll. Hy. Edw., taken by myself on flowers of *Cynoglossum grande*, Dougl.; Napa County; Big Trees, Calaveras County, Cal.; Vancouver Island.

The species of the genus *Hemaris* are very closely allied, and can be separated only by characters which in other genera would hardly be deemed sufficient to indicate a difference of species. I think, however, that the absence of colored hairs on the basal segments of the abdomen, and of the pencils of yellow hairs on the hind tibiae, will serve as good grounds for separating this form from its allies. The differences between them are very apparent in a series of each.

Hemaris palpalis. Grote.

Taken at Gilroy, Santa Clara County, by the late G. R. Crotch. Its chief difference from *Thetis* seems to be in the darker shade of the labial palpi.

It is somewhat remarkable that no species of Mr. Grote's genus *Hemorrhagia* has yet been discovered on the Pacific Coast, more especially as in the Atlantic States the species are more numerous than those of *Hemaris*.

Ellopos tantalus. Hubner.

This fine insect is not rare in the neighborhood of Mazatlan and other portions of Northern Mexico, and I have seen a specimen taken at Cape St. Lucas, Lower California. It may, therefore, yet be found within our limits.

Euproserpinus Phaeton. G. & R.

= *Macroglossa Erato*. Bois.

This exquisite little species, so rare at present in collections, appears to be found only in the vicinity of Los Angeles, two specimens in the collection of Dr. Behr and the original types in that of Dr. Boisduval having been obtained from that locality. It is said to be an early insect, and probably disappears with the flowers of the spring.

Proserpinus Clarkii. Bois.

As the delicate green tint of this beautiful insect fades very quickly, I sub-join the following description from a very fresh specimen, taken during the past summer, in which the original color is at present admirably preserved. It will be seen that both Clemens' and Boisduval's descriptions give a wrong idea of the color of the insect.

Head, greenish olive above, whitish beneath; labial palpi, whitish, with green tinge. Eyes and tongue, brownish black. Antennæ, black above, reddish beneath; terminal spinule, white, with the extreme hook yellowish brown. Thorax above, greenish olive, whiter at the sides and beneath. Abdomen, greenish olive with a white tinge, except the three anal and the fifth segments, which are dark olive green, the anal segment being marked in the center with a paler streak. Beneath, the abdomen is greenish olive, with the segments edged posteriorly with white. Anterior wings, rich greenish olive, the color of *P. Enothera*, paler at their base, except towards the costa, where there is a darker shade. "The median space is rich greenish olive, narrowing to the internal margin, and enclosing a black discal streak." Behind this band, and resting on the internal margin, is a pinkish shade, not visible in old specimens, and beyond this is a rich olivaceous band, spreading to and widening out upon the costa, the outer edge being somewhat notched. Fringe of the anterior wings, olive green, tipped with black. Posterior wings, bright orange yellow, with a broad and moderately regular black marginal band. Fringes, yellowish white. Under side of wings, wholly olivaceous green, darkest at the base. Across the disc of the posteriors is a slightly waved whitish band. The discal streak of the anteriors is scarcely visible. Feet and legs, whitish green.

Not rare in the northern portion of California and southern Oregon. A number of specimens were taken by Lord Walsingham, near Fort Klamath, and it occurs not unfrequently, in May and June, throughout the Coast Range and the Sierra Nevada. It appears to delight in the flowers of the various species of *Gilia*. Dr. Boisduval says that his specimen was raised from the caterpillar by the late Mr. Lorquin. It is a matter of regret that we possess no record of its earlier stages.

This is undoubtedly the species referred to by Mr. Grote in Bull. Buffalo N. H. Soc., 1874, as *Lepisesia Victoria*, the description having been evidently drawn up from a somewhat faded specimen.

Proserpinus Terlooii, n. sp. Hy. Edwards.

Head and palpi, yellowish olive. Eyes, black. Antennæ, dark olive; pectinations, brown; hooked tip, white. Thorax and abdomen, yellowish olive, the former with some darker shading in front. Anterior wings, yellow olive, greener towards their outer margins, with a median band of olive green, widest on the costa, and a triangular patch, a little paler than the band, resting on the costa near the apex. Fringe, mottled with brown. Posterior wings, dull claret red, paler along the costa, and shading into deep rich brown on the posterior margin.

Under side. Anterior wings, yellow olive, with a wide central shade of dull red, reaching from the base to within three lines of the margin, but not touch-

ing the costa. Posterior wings, yellow olive, with indistinct waved median band of a little darker color.

Expanse of wings, 1.65 inch.

Length of body, 0.70 inch.

Two ♂ Coll. Dr. Behr, taken near Mazatlan, Mexico, by the late Baron Terloo, to whom, at Dr. Behr's request, I dedicate this interesting species.

Tribe CHÆROCAMPINI.

Choerocampa procne. Clemens.

I can learn nothing whatever of this insect, and think some error must have occurred as to its locality. Is it known that the type specimen is in existence, and, if so, where?

Deilephila chamaenerii. Harris.

This species, which I am disposed to regard as different from *Galii* of Europe, is not uncommon in Vancouver Island, and has been occasionally taken in Oregon and Northern California. It would satisfy many entomologists if a long series of this insect could be raised from the caterpillar, through a succession of years, as by these means alone can we arrive at a certain conclusion as to its value as a species. It seems to me to be a much heavier and more clumsy-looking insect than *Galii*, and its general color is considerably darker. But it appears somewhat absurd to claim for this the rank of a species, and deny the same position to its congener, which follows, as between *Daucus* and *Livornica* more really serious differences exist than between *Chamaenerii* and *Galii*.

Deilephila Daucus. Cramer.

This is perhaps the most common of all the *Sphingidae* of the Pacific Coast, being found from May to August in almost every garden, hovering about flowers, especially those of *Verbena*. The caterpillar, though well known, has never, to my belief, been described or figured. It feeds on various species of *Rumex*, *Epilobium*, and *Polygonum*. The additional white stripes upon the thorax certainly give this a wide separation from *Livornica* of Europe, while there is considerable difference in the shape of the median oblique band of the anterior wings. In a specimen of *Livornica* from Italy, and also in one from the White Nile, (both in my collection) this line is broader than in the American specimens, and, as it reaches the internal margin, spreads inwardly further towards the base of the wing. The costal markings also are more decided in the European and African specimens, and the marginal band of the posterior wings is certainly much narrower.

Philampelus Linnei. G. & R.

A fine specimen of this very handsome species exists in Dr. Behr's collection. It was taken by the late Baron Terloo in the northern part of Sonora, Mexico, at the base of the Sierra Madre.

Philampelus Achemon. Harris.

Very common, in some seasons, in the valleys of Napa and Sonoma Counties, where the caterpillar is exceedingly injurious to the vines. In the summer of 1874, at St. Helena, Napa County, over ten bushels of caterpillars were gathered from one vineyard, only four acres in extent, in the course of two days. I can perceive no difference whatever between the California specimens and those from the Eastern States.

Tribe SMERINTHINI.

Smerinthus ophthalmicus. Bdv.

Formerly rather common in the vicinity of San Francisco, but owing to the drainage of large districts, and the consequent destruction of the willows on which the caterpillars fed, it has become quite a rare species. In the foothills of the Sierras and the Coast Range, as well as in Oregon and Vancouver Island, it is occasionally met with, and a strongly marked variety is also found, which I have called

Smerinthus pallidulus, var. Hy. Edw.

It differs from the typical form by its much paler color, as well as by the almost obsolete markings of the upper wings. The general color of these is a pale fawn drab, with the waved band indistinct. The thorax is also much paler, and the median patch of this portion much narrower and less defined.

Mr. Strecker's figure of the ♀ in Lepid. Rhop. et Heter. refers to this variety.

Smerinthus modestus. Harris.

Another very remarkable instance of departure from the specific type is found in our examples of this species, all of which are very large in size, the smallest I have seen being upwards of five inches in the expanse of wing, the specimens from the Atlantic States rarely measuring as much as four inches. There is also a remarkable difference in color, the western specimens being much paler, the basal space within the median band being, for the most part, of a delicate silver gray, which color is also extended to the thorax and abdomen. The white discal streak is also more strongly defined, and the suffused reddish patch of the lower wings usually much larger. Knowing nothing of the caterpillar, I am unable to say if any difference exists between it and its eastern relative, but it is possible that in this instance we have to deal with a new species. I prefer, however, at present to regard it only as a variety, suggesting for it the name of

Smerinthus occidentalis, var. Hy. Edw.

Fort Yuma, Ariz. San Diego. Sacramento, Cal. Carson City, Nev. Dalles, Oregon.

Coll. H. E.

Tribe SPHINGINI.

Macrosila carolina. Clem.

As far as I am able to discover, this species was unknown in California until the introduction of tobacco planting, a few years ago. It is now very common in some portions of the State, particularly in the San Joaquin and Santa Clara valleys, and promises to be as great a pest to the growers of tobacco as it has proved in other parts of the continent.

Macrosila celeus. Hbn.

Rather rare at present, though it has been taken near San Diego, and in Mendocino and Napa Counties. The caterpillar feeds upon the potato, and it is probable that, like the preceding species, this may be an introduction from the Atlantic Coast.

Macrosila cingulata. Fab.

I have seen only two Pacific Coast specimens of this insect, one from San Diego, the other from Santa Barbara. It is very abundant in the Hawaiian Islands, where the caterpillar feeds on the sweet potato (*Batatas edulis*).

Sphinx oreodaphne. Hy. Edw. (Proc. Cal. Acad. Sci., July, 1873.)

My friend Mr. H. Strecker, of Reading, Pa., has suggested to me that this may be only a small form of *Sph. chersis*, Hbn., and certainly there is a great resemblance, excepting in point of size, the largest specimen of *Oreodaphne* I have seen measuring only $3\frac{1}{2}$ inches in expanse, the smallest $2\frac{3}{4}$ inches, while the average size of *Chersis* is $4\frac{1}{2}$ inches. The markings, also, even in the most perfect specimens, are much less pronounced than those of *Chersis*, and the general color of the insect is much paler. If, however, Mr. Strecker's conjecture be correct, the synonymy will have to be

Sphinx chersis. Hbn.

Var. *Oreodaphne.* Hy. Edw.

Sphinx perelegans. Hy. Edw. (Proc. Cal. Acad. Sci., July, 1873.)

I am inclined to think that this and the following species are only two of others which will yet be found in California, having an affinity with *Sp. gordius* and *Sp. eremitus* of the Atlantic States. The only specimen of this species was taken by the late G. R. Crotch, at Gilroy, Santa Clara County, and is in my collection.

Sphinx Vancouverensis. Hy. Edw. (Proc. Cal. Acad. Sci., July, 1873.)

Since describing this species, I have had the good fortune to procure two other specimens, one from Portland, Oregon, and the other from the Big Trees of Calaveras County. They are so strongly marked as to put to flight any doubts I may have entertained as to the genuineness of the species.

Hyloicus Sequoie. Bdv.

I am only acquainted with one specimen of this very rare species, taken by myself in Bear Valley, Placer County, and noticed in Proc. Cal. Acad. Sci., July, 1873.

Hyloicus Strobi. Bdv.

Dr. Boisduval is himself in doubt as to the locality of this species, and without a careful examination of the type it is difficult to say whether it be Californian or not.

LIST OF SPECIES NOTICED IN THIS PAPER.

<i>Arctonotus lucidus</i> , Bdv.....	California, Oregon.
<i>Hemaris Thetis</i> , Bdv.....	California.
<i>Hemaris rubens</i> , Hy. Edw. n. sp.....	California, Oregon.
<i>Hemaris cynoglossum</i> , Hy. Edw. n. sp.....	California, Vancouver Island.
<i>Hemaris palpalis</i> , Grote.....	California.
<i>Allopos tantalus</i> , Hubn.....	Mazatlan, Mex.
<i>Euproserpinus Phaeton</i> , G. & R.....	Los Angeles, Cal.
<i>Proserpinus Clarkie</i> , Bdv.....	California, Oregon, Vancouver Island.
<i>Proserpinus Terlooti</i> , Hy. Edw. n. sp.....	Mazatlan, Mex.
<i>Choerocampa procne</i> , Clem.....	Loc. dub.
<i>Deilephila chamenerii</i> , Harris.....	California, Oregon, Vancouver Island.
<i>Deilephila daucus</i> , Cram.....	Arizona, California, Nevada, Oregon, V. I.
<i>Philampelus Linnei</i> , G. & R.....	Mazatlan, Mex.
<i>Philampelus Achemon</i> , Harris.....	California, Oregon.
<i>Smerinthus ophthalmicus</i> , Bdv.....	California, Oregon, Vancouver Island.
<i>Smerinthus ophthalmicus</i> , n. var. <i>pallidulus</i> , Hy. Edw.....	California.
<i>Smerinthus occidentalis</i> , n. sp. (?) Hy. Edw.....	Cal., Nev., Oreg., Ariz.
<i>Macrosila carolina</i> , Clem.....	California generally.
<i>Macrosila celeus</i> , Hbn.....	California.
<i>Macrosila cingulata</i> , Fab.....	San Diego and Santa Barbara, Cal.
<i>Sphinx oreodaphne</i> , Hy. Edw.....	California, Oregon.
<i>Sphinx perelegans</i> , Hy. Edw.....	Gilroy, Cal.
<i>Sphinx Vancouverensis</i> , Hy. Edw.....	California, Oregon, Vancouver Island.
<i>Hyloicus Sequoie</i> , Bdv.....	Sierra Nevada, Cal.
<i>Hyloicus Strobi</i> , Bdv.....	Loc. dub.

From the Proceedings of the California Academy of Sciences, May 17, 1875.

Pacific Coast Lepidoptera.—No. 12. On some New Species of
Noctuidæ.

BY HENRY EDWARDS.

The species of moths described in this paper belong to the group *Anartida*, many interesting forms of which have been recently figured by Mr. Grote, in the Bulletin of the Academy of Sciences of Buffalo. Their extreme rarity in collections has always rendered them a favorite division of the family, and more than one of the genera now noted would appear to be confined to the Pacific States and Territories. The genus *Annaphila*, recently founded by Mr. Grote upon a Californian species, *Ann. diva*., is remarkable for the lightness of the color of the lower wings, the system of coloration much resembling that of the genus *Catocala*. The insects fly in the hottest sunshine, and with the greatest rapidity, alighting only occasionally, when the harmony of color existing between the upper wings and the lichen-covered rocks or trees to which they attach themselves, renders them almost invisible. They are, therefore, very difficult of capture, and can really only be taken while on the wing, the process requiring a sharp eye and a steady hand. Nothing whatever is known of their larval condition. *A. diva*, *A. depicta*, and *A. amacula* are the most common of the group, the remainder being only found in my own collection, or in that of my friend Dr. Behr, who has generously placed his unique species at my disposal for description. I have in all cases adopted his MS. specific names, as applied to the specimens in his cabinet. The genus *Axenus* is found on flowers in the early spring, the species *Ax. arvalis*, on which Mr. Grote has founded the genus, being common in warm pastures throughout the State, as early as the first weeks in March. It is to be expected that diligent search, particularly in the southern portion of the State, will reveal many other species of these beautiful and interesting moths, and the attention of entomologists is earnestly directed to them.

Anarta Kelloggii, n. sp. Hy. Edwards.

Head, thorax, and abdomen, black, with silver gray hairs.

Primaries, black, mottled with silver gray. The basal half line and the t. a. are indistinct, the latter only very slightly dentate; orbicular and reniform, very distinct, the former brownish, the latter surrounded by a white cloud. T. p., bent anteriorly after reaching the middle, distinct near internal margin, and edged outwardly with gray. Sub-terminal line whitish, tri-dentate, edged

anteriorly with black shade, most strongly marked on the costa; marginal line black, cut with white streaks. Fringes blackish, mottled with gray.

Secondaries, black, with white median fascia, not reaching to anal margin. Fringes white.

Beneath, both wings are largely white. Primaries, with the base and a broad sub-marginal fascia, dusky black. Secondaries, with base, small discal spot, and rather wide sub-marginal band, also dusky black.

Expanse of wings, 1.35 inches.

(Coll. Hy. Edwards, No. 5534.)

Taken in Tuolumne County, Cal., by Dr. A. Kellogg, to whom I am indebted for much valuable material, and to whom, with sincere regard, I dedicate this species. It is allied to *A. melanopa* of Labrador, but differs considerably by the more elaborate markings of the primaries, the much wider black margins of the secondaries, and the darker and more pronounced coloring of the under side.

Anarta crocea, n. sp. Hy. Edwards.

Primaries, grayish brown, speckled with black. Basal half line much bent inwardly at its conclusion. Between it and the t. a., the space is covered by mingled brown and white scales. T. a., which is gray, edged with black, runs obliquely from costa to beyond the middle, then forms a double tooth as it reaches the internal margin; orbicular and reniform, white, well defined; median space darkest towards internal margin. T. p., white, with anterior edge blackish, rounded from costa, and almost lunate in form. Behind it are many white scales on a brownish ground, most strongly marked on the costa. Sub-term. consisting of a blackish shade, approaching the t. p. by a series of black dots. Fringe, gray, mottled with black. Thorax and abdomen, light gray, sprinkled with black.

Secondaries, yellow orange at base, with rather wide black margin. Fringes, white.

Beneath, the wings are yellow orange, the lower side the darkest, with rather wide black margin, the costa of each sprinkled with brownish scales.

Expanse of wings, 0.85 inch.

Dalles, Oregon. (Coll. Hy. Edwards.)

It is possible that this species may form the type of a new genus, though the similarity of its system of coloration to the European *A. myrtilli*, induces me to place it here.

Melicleptria venusta, n. sp. Hy. Edwards.

Head and thorax, rich chocolate brown; abdomen, black, with the anal hairs golden brown.

Primaries, with the base and outer margin rich chocolate brown. T. a., deeply notched anteriorly in the center. T. p., with a tooth extending outwardly, the space between these lines being cream white, except on the costa, where there is a light brown spot. Orbic., obsolete. Reniform, distinct, ovate, dusky. Fringes, brown.

Secondaries, blackish brown, with large white patch occupying the whole of

the center of the wing, but not reaching to the anal margin. In this space near the base are some black scales. Fringes, white.

Beneath, primaries largely white, with costa and base broadly blackish, and a very large and distinct black discal spot. Margins, blackish, widely so at apex. Secondaries, same as the upper side.

Expanse of wings, 1.05 inch.

(Coll. Hy. Edwards.) Klamath Lake, Oregon. Lord Walsingham.

A most exquisite and remarkable species.

Melicleptria vaccinia, n. sp. Hy. Edwards.

Anarta vaccinia. Behr. MSS.

Head and thorax, brown, with a few brown scales; abdomen, blackish brown, with the base of segments whitish.

Primaries, light brown, with a golden tinge; base of the wing darker than the other portion. T. a., only moderately curved, very slightly dentate anteriorly as it reaches the internal margin. Median shade, whitish, brown as it reaches the costa. Orbicular, almost obsolete. Reniform, large, distinct. T. p., whitish, bent considerably outwards near costa, nearly straight towards internal margin. Sub-term., sharply toothed in the middle; resting upon this line are four or five black dashes. Fringes, shining golden brown, with darker patches.

Secondaries, black, with median white fascia, broadest behind the middle, but not reaching to the anal margin. Near the outer margin is a small white streak, suggesting a submarginal band. Fringes, white.

Beneath, primaries black, reddish near costa, with broad median band, a kidney-shaped spot near apex, and anteriorly notched marginal band, all cream white. Secondaries, black, with a large space near the costa, reddish white, and a nearly oblong spot in center of wing, cream white. Behind this is also a small white spot. Fringes of both wings as in the upper side.

Expanse of wings, 0.75.

(Coll. Dr. H. Behr.) Sierra Nevada, Cal.

Melicleptria fasciata, n. sp. Hy. Edwards.

Primaries, fawn drab. Between t. a. and base, a slightly darker streak extends along the internal margin, and more slightly along the median nervule. T. a., almost obsolete. Median space, whitish, forming with white fascia of secondaries an almost continuous band. Orbicular and reniform, white, distinct. T. p., blackish, commencing very near the apex, then slightly bent inward, and straight as it reaches the outer margin; behind it a dark externally toothed shade. Margin, whitish, with fringe a little darker.

Secondaries, black, with rather narrow white median fascia, toothed in the center, and not reaching the anal margin. Fringe, white.

Beneath, primaries largely whitish, with a streak from base almost to center of wing, and a large irregular blotch on apical margin, black, leaving the interior margin, a large portion of costa, and the apex, white. Along costa of both wings are a few reddish scales.

Expanse of wings, 0.80.

(Coll. Hy. Edwards, No. 203.) Placer Co., Cal.

Very nearly allied to *M. vacciniae*, of which it may possibly be the other sex, but the differences of the under side are very striking, and while the base of the primaries is almost black in *vacciniae*, in the present species it is dark fawn drab. The t. a. and t. p. lines are also much straighter than in the preceding species, and the median shade, with white fascia of secondaries, form a much more continuous line.

Melicleptria oregonica, n. sp. Hy. Edwards.

Anthoecia oregonica. Behr. MSS.

Head, thorax, and abdomen, blackish, with gray hairs.

Primaries, chestnut brown, with golden reflection. As in *M. suctus*, Grote, the traces of the ordinary lines are lost. The base is dark, almost black, with the orbicular white and well defined. Beyond the middle and enclosing the reniform is a white band, bent inwardly, indistinct on costa, and not reaching to the internal margin, Sub-term., nearly straight, whitish.

Secondaries, blackish brown, with rather broad white median fascia, which is interrupted and almost divided near anal angle. Near exterior margin is also a white oblong spot. Fringe, whitish.

Beneath, primaries, white, with two nearly square spots in center, a line resting on the anterior one directed towards the base, and an almost regular submarginal band, brownish black. Secondaries, also white, a large kidney-shaped discal spot, and a marginal band reaching from base beyond anal angle, blackish.

Expanse of wings, 1.00 inch.

Coll. Dr. Behr. (Hy. Edwards, No. 4405.) Oregon. Colorado.

Heliothis Crotchii, n. sp. Hy. Edwards.

Fawn drab, with blackish brown markings. T. a., much toothed exteriorly near internal margin. Median shade, pale. Orbicular and reniform, both distinct, the latter surrounded by a brownish cloud. T. p., commencing very near the apex, bending inwardly about the middle, thence almost straight to internal margin. Beyond this is a brownish dentate fascia, the dentations formed by the sub-term. line. Marginal line composed of black dots. The whole of the nervures are pale and distinct, giving a reticulated appearance to the surface.

Secondaries, dusky, whitish towards the base, with clouded discal dusky spot.

Beneath, yellowish drab; primaries, with large discal spot, and some dashes near the base, blackish brown; margin, wide, dusky, with sub-terminal line pale. Fringes, drab, mottled with brownish. Secondaries, yellowish drab, with oblong discal spot, marginal, and submarginal band, dusky. Thorax and abdomen, yellowish, with darker scales, both paler beneath.

Expanse of wings, 1.00 inch.

(Coll. Hy. Edwards, No. 5533.) San Diego. G. R. Crotch.

Axenus ochraceus, n. sp. Hy. Edwards.

Very similar to *A. arvalis*, Grote, but differing by a large basal dark space, and by the t. a. being bent angularly forward on the costa, not nearly straight

as in the more common species. The median shade is gray and well defined, contrasting very strongly with the rest of the wing surface, which is ochreous brown. The whole of the lines are more strongly marked than in *arvalis*. The secondaries are blackish at the base, with a decided ochreous band, enclosing a narrow black fascia. Fringes, yellowish. Beneath, ochreous, with same markings as those of the upper side, but much fainter in tone. The posterior wings have almost an orange tint. Size of *arvalis*, of which, should it prove to be a variety, it is certainly a very extreme one.

San Diego. G. R. Crotch. (1 ♂. Coll. Hy. Edwards, No. 5535.)

Axenus amplus, n. sp. Hy. Edwards.

A very distinct and peculiar species, in which the wings are much broader and more rounded than in *arvalis*, and the lines and spots, with the exception of the sub-term., utterly obliterated. The color is greenish olive, with a few white scales sparsely scattered over the whole surface of primaries. Sub-term. line, whitish, much curved inwardly as it reaches the internal margin. Secondaries, with faint discal dot, a few scales, and an imperfect submarginal band, whitish. Fringes of both wings, white. Beneath, greenish drab, the primaries darkest, discal spot paler, large, reaching almost to costa. The secondaries have the base dusky, with three more or less perfect dusky fascia. The margins of both wings are black, and the fringes greenish drab.

Expanse of wings, 0.80 inch.

Lake Klamath. Oregon. Lord Walsingham, by whom a ♂ and ♀ were kindly added to my collection.

Annaphila arvalis, n. sp. Hy. Edwards.

Evastria arvalis. Behr. MSS.

Primaries, dull, grayish black, with all the lines exceedingly indistinct. The t. a. black, only slightly notched exteriorly, and edged posteriorly with whitish. Median shade, blackish, with a few whitish scales beyond. Reniform, almost lost in the gray scales surrounding it. Fringes, blackish, flecked with white.

Secondaries, pale yellow, with a dull black basal triangular patch, enclosing some yellow spaces. Margin, very narrow, even narrower than in *A. depicta*, Grote, and almost regular interiorly.

Beneath, both wings are yellow. Primaries, with broad black margin, widest at apex, and a narrow black transverse fascia, slightly bent outwardly near anterior margin. Secondaries, with narrow marginal band as in the upper side, and narrow waved median band, behind which is a black discal spot.

Expanse of wings, ♂ 0.90. ♀ 1.05.

The largest species of the genus known to me.

Sierra Nevada, Cal. (♂ ♀. Coll. Dr. Behr.)

This is in some respects intermediate between *A. depicta*, Grote, and *A. danistica*, Grote, but differs from the former by its pale color, and by the absence of the discal spot of secondaries above, as well as by its larger size, and from the latter by the very different ornamentation of the under side.

Annaphila lithosina, n. sp. Hy. Edwards

Erastria lithosina. Behr. MSS

Primaries, dark fawn color, with the markings all rich velvety black. Basal half line more distinct than usual in this genus, and enclosing posteriorly a few white scales. T. a., very deeply dentate outwardly in the middle. Median shade, blackish, with a few bluish scales, especially around the orbicular, which is dark fawn color. T. p., also dentate exteriorly, becoming almost straight as it reaches the margin. Outside the t. p. is a large, ovate, pure white spot, nearly reaching the costa. Reniform, obsolete. Beyond this, there is a bright fawn-colored shade, spreading from costa to internal margin, and joining the sub-term. line, which is blackish, terminating on costa in a white dash, and surrounded at apical angle by a few bluish scales.

Secondaries, bright orange; margin rather broad, deep black, widest towards costa, and deeply toothed internally. Basal space, blackish, with imperfect orange blotches, and a small black spot near anal angle.

Beneath, primaries bright orange; transverse fascia, broad and nearly straight, black patch at the margin enclosing some yellow spots. Secondaries, margin as in the upper side, with a waved, broken fascia near the base. There is also a minute black spot resting on the costa.

Expanse of wings, 0.90 inch.

Sierra Nevada, Cal. (Coll. Dr. H. Behr.)

Dr. Behr informs me that this exquisite species is taken on the flowers of *Sambucus*. I saw a single specimen during the past summer at the Big Trees, Calaveras Co., which was hovering about the flowers of Dogwood (*Cornus Nuttallii*).

Annaphila amicula, n. sp. Hy. Edwards.

Primaries, blackish, with gray lustre. T. a., bi-dentate near the interior margin. Orbic., small, round, grayish. T. p., nearly straight, with only one tooth near the middle. Reniform, large, almost lost in the gray color which clothes the outer portion of the wing. Sub-term., velvety black, not reaching more than half way across the wing, divided on costa, and then enclosing some white scales. Marginal line, divided into a series of dots. Fringes, grayish.

Secondaries, bright orange, base black, extending along the anal margin, where the black line is slightly cut by an orange streak. Marginal band, rather narrow, but wider than in *A. depicta*, and only slightly notched interiorly. The discal spot is large, and a narrow black fascia, bent outwardly near the middle, extending across the wing.

Beneath, primaries, bright orange, shading into yellow on internal margin, a narrow transverse fascia, perfectly straight, and a large oblong discal spot, black. The margin broadly blackish, with yellow scales, widest at apex, and extending along costa, almost to the extremity of the transverse line. Secondaries, orange, with median transverse fascia, toothed near anal angle, and an oblong discal spot behind it, black. Between this and the marginal band are a few spots, suggesting the idea of a submarginal fascia. Margin, blackish, flecked with orange scales.

Expanse of wings, ♂ 0.60. ♀ 0.75.

San Mateo Co., Cal. (Coll. Hy. Edwards, No. 2587.)

Annaphila germana, n. sp. (?) Hy. Edwards.

Probably only a variety of the preceding. The primaries are exactly like those of *amicula*, except that all the lines and marks are more distinct, and the gray shade beyond the t. p. lighter in color and more strongly marked. The secondaries are bright orange, but have no median fascia, and the base is wholly black, while the marginal band is much wider than in the last species, and less deeply toothed interiorly. Beneath, there is little difference, except that the spots and lines are rather less strongly marked.

Expanse of wings, 0.75 inch.

Napa Co., Cal. (1 ♂. Coll. Hy. Edwards, No. 4379.)

Annaphila domina, n. sp. Hy. Edwards.

Primaries, darker than in any other known species, being deep black, with shadings of gray. All the lines, except the basal half, distinctly marked. T. a. almost straight, or with only a very small dentation in the middle. Orbic. and reniform, distinct, velvety black, the latter almost oblong. Across the median shade is a small patch of white scales, and a larger one outward of the t. p., which is arched on costa, dentate inwardly near the middle, and then continued straight to internal margin. Sub-term. almost wanting, the posterior margin of wings being dull slate black, with no distinct markings. Fringes, also slate black.

Secondaries, rich dark orange, with moderately wide border, only slightly notched internally, and extending all round the wing to the base, with an oblong discal spot, black. Fringe, black.

Beneath, the primaries are marked with the same system of coloration as those of *A. danistica*, but the orange is very much darker and richer in shade. The discal spots are three in number, each circled with orange. Beyond them is a transverse arcuate line joining another, extending along internal margin to base of wing. Margin, dusky black, apices broadly so. Secondaries, orange, with some scattered black scales along costa, and a black marginal band of moderate width extending to the base, speckled with white scales. Discal spots small, almost linear. Tarsi and under side of abdomen with greenish and golden scales.

Expanse of wings, 0.75 inch.

San Mateo Co., Cal. (♂. Coll. Hy. Edwards, No. 5720.)

Annaphila superba, n. sp. Hy. Edwards.

Head, thorax, and abdomen, brownish black, sprinkled with gray scales.

Primaries, also blackish, with gray scales. The whole of the lines rather indistinct. Median shade, dark, with whitish scales. Orbic., obsolete. Reniform, blackish, surrounded by white ring. T. p., whitish, bent outwardly near the middle. Beyond this are some white scales, forming an imperfect fascia. Sub-term., black, not reaching internal angle, and between it and the margin are a few more white scales.

Secondaries, bright crimson red, margin of medium width, black, quite regular, and not toothed in any portion.

Beneath, both wings orange red, shading into yellow, and surrounded by

rather broad black margin. Primaries, with discal spot, and faint submedian fascia, black. Secondaries, with discal spot, and faint transverse line near the base, also black. Fringes, above and below, grayish.

Expanse of wings, ♂ 0.55. ♀ 0.70 inch.

Marin and Napa Counties, Cal. (Coll. Hy. Edwards, No. 4381.)

A very beautiful species, not to be confounded with any other, the bright crimson of the lower wings (as rich as in those of *Catocala cara*) and the regular black margin serving to distinguish it.

LIST OF SPECIES DESCRIBED IN THIS PAPER.

<i>Anarta Kelloggii</i> , n. sp.	Sierra Nevada, Cal.
" <i>crocea</i> , n. sp.	Dalles, Oregon.
<i>Melicleptria venusta</i> , n. sp.	Klamath Lake, Oregon.
" <i>vacciniæ</i> , n. sp.	Sierra Nevada, Cal.
" <i>fasciata</i> , n. sp.	Placer County, California.
" <i>oregonica</i> , n. sp.	Oregon, Colorado.
<i>Heliothis Crotchii</i> , n. sp.	San Diego.
<i>Acenus ochraceus</i> , n. sp.	San Diego.
" <i>amplus</i> , n. sp.	Dalles, Oregon.
<i>Annaphila nivalis</i> , n. sp.	Sierra Nevada, Cal.
" <i>lithosina</i> , n. sp.	Sierra Nevada, Cal.
" <i>amicula</i> , n. sp.	San Mateo County, Cal.
" <i>germana</i> , n. sp. (?)	Napa County, Cal.
" <i>domina</i> , n. sp.	San Mateo County, Cal.
" <i>superba</i> , n. sp.	Napa and Marin Counties, Cal.

From the Proceedings of the California Academy of Sciences, June 7, 1875.

Pacific Coast Lepidoptera, No. 13.—On the Earlier Stages of *Vanessa Californica*.

BY HENRY EDWARDS.

In a very interesting and valuable article by Dr. H. Behr, on the "*Vanessidae* of California," published in the third volume of this Society's Proceedings, reference is made to the large swarms of *Vanessa Californica* observed some years ago in the neighborhood of San Francisco, and the simultaneous occurrence in various parts of the State of this insect, which, in ordinary years, cannot be otherwise regarded than as one of our rarer species. By a fortunate circumstance, I am enabled to add a few facts to the natural history of this butterfly, and at the same time to present a description of its earlier stages, which have been hitherto unrecorded. In an excursion up the cañon at the head of Richardson's Bay, at the base of Mount Tamalpais, on the 9th of May last, I observed, soon after leaving the open fields and passing into the more secluded portion of the gulch, myriads of caterpillars on every side, swarming on the ground and on every blade of grass. A further and closer search disclosed the fact that the bushes of *Ceanothus thyrsiflorus*, which here attain a large size, sometimes reaching as great a height as twelve or fifteen feet, were utterly stripped of their leaves, looking as if some pestilence had passed over them, and destroyed every vestige of their flowers and foliage. It was not difficult to divine that this denudation was owing to the multitudes of caterpillars which had made their home upon the plants, on which they were to be found in nearly all the stages from about the third moult to full-grown larvæ. It is not too much to say that they could be counted in millions, for, in following the creek, which runs through the cañon, for upwards of a mile, I found the *ceanothus* growing abundantly, and the same circumstances of the immense numbers of the insect, and consequent destruction of the foliage of the plant, everywhere displayed themselves. The eggs of the parent insect appear to have been deposited in clusters, as I noticed upon the extremities of many of the branches small webs in which the cast skins of the young larvæ were very abundant, thus suggesting the idea that in their earlier stages the caterpillars are gregarious, not separating from their common home until about the period of the third moult. I found several of these skins, sufficiently perfect to enable me to offer a fair comparison of the young larvæ with their appearance in the more advanced stage in which they came immediately under my observation. I sought carefully for any *Ichneumonidae* or other parasitic insects which might be present, imagining that so large an assemblage of larvæ would prove

for them a certain attraction, but I did not succeed in taking a single specimen, nor as yet have any appeared among the caterpillars which I brought home with me. I have, however, observed in my breeding boxes four examples of a rather large dipterous parasite, probably of the genus *Tachina*. As, however, I carried away with me nearly ninety caterpillars, all of which passed successfully into the chrysalis state, this is but a very small proportion to be affected with parasitic enemies. Is it possible that this comparative immunity is owing to the sharp and formidable looking spines with which the caterpillars are furnished? Certain it is that the *Vanessa* generally are more exempt from the attacks of Ichneumons than most other butterflies.

During the last summer, the young lupines in the Golden Gate Park were attacked by myriads of caterpillars, which at one time threatened their destruction, but the preservation of the small birds in and about the park kept down the swarm, and a succession of very cold winds, during the middle period of their growth, killed them off in thousands. I raised from the caterpillars, of which I took away with me upwards of a hundred, no less than eighty-five specimens of *Pyrameis Cardui* and *Pyrameis Huntera*, and not a single one among them was observed by me to be attacked by parasites. This, in conjunction with the facts noted above, with reference to *Vanessa Californica*, would seem to indicate that these insects enjoy a freedom from the assaults of their tiny foes, which is not granted to other members of their tribe. It may partially account for the vast swarms of the various species which periodically make their appearance in different parts of the world. But this is one of those singular occurrences connected with insect life, which are so difficult to explain satisfactorily. The cañon in which *Vanessa Californica* was found has been visited by J. Behrens and myself at least twice every season for the last six years, and though I have invariably sought most diligently for caterpillars, until now that of the present species has been utterly unknown to me.

It may with almost certainty be predicted that the coming fall will witness the same large swarms of this butterfly as those observed by Dr. Behr in 1856 and 1866, which dates will serve to indicate that the insect appears in such numbers about once in nine or ten years. The caterpillars collected by me fed voraciously, and changed into the chrysalis state from the eleventh to the twenty-fourth of the month, the transformation of all I had secured being complete by the latter date. In this condition, they were extremely restless, constantly keeping up a jerking motion, and knocking themselves against the lid and sides of the boxes in which they were placed, with such force as to be heard all over the house. On the 23d of May, my friend Samuel Williams, of the *Evening Bulletin*, was enjoying a picnic in the cañon mentioned above, when the attention of his party was drawn to a very singular noise in the bushes over their heads, the cause of which it was for a time difficult to discover. At last it was found to proceed from myriads of chrysalides, attached to the leafless stems of the *ceanothus*, which by a constant motion of their bodies gave a trembling to the branches of the shrub, and produced the singular and half weird noise referred to. The perfect insects began to appear on the 25th of May, and did not all emerge until the 6th of June, the average time in the chrysalis state being about fourteen days. The young caterpillars are wholly jet black, with the spines shorter than they are towards maturity, and

without any trace of the steel-blue, shining tubercles, which are so strong a characteristic of their more advanced stages.

After the third moult the following is the appearance of the caterpillar: head, moderate, jet black, shiny, with two short branched spines on the crown, and a series of smaller ones on the sides in front. In the center of the head is a groove. Body, deep velvety black, each segment behind the head with five branched spines, at the base of which are bright, steel-blue tubercles. In the sunlight these tubercles, from their highly polished surface, glisten almost like jewels. Between the spines, and particularly about the dorsal region, are a number of small white circular dots, from each of which springs a short whitish hair, and a rich, black velvety line, sharply defined, extends from the base of the head to the anal segment. The latter is furnished with only two branched spines. Prolegs, black; abdominal legs, dirty yellow. Length, 1.00 inch.

Mature larva. There is no change except in size until the final moult, when the middle spine of each segment becomes bright yellow at the base, and the white spots at the base of the hairs larger and more numerous, giving the appearance of a yellow dorsal line. Length, 1.65 inch.

Chrysalis. General color, ashy gray, with bluish efflorescence; abdomen, fawn color; head, with two rather sharp, well-developed, blackish processes; thorax, mottled with brownish, with two angular spines near the junction of the wings; mesonotal process, rather large, brown, with sharply hooked spine directed backwards. On the sides of the thorax are four black points, the basal ones surrounded by a cream-white patch which extends to the first abdominal segment. Wing covers, ashy, brown along the margins; basal abdominal segment, with two small, black spines, behind which are large cream-white patches. The remaining abdominal segments have each two black points surrounded with black patches, growing smaller and fainter towards the anal extremity. Spiracles, black, almost linear, with a series of black dots above and below. The anal segments are much arched, directed inwardly toward the exterior of the wings. Length, 0.65 inch. There is no trace of silver upon any part of the surface of the chrysalis.

As *Vanessa Californica* has been said by some authors to be identical with the European *Polychloros*, I subjoin, for comparison, a brief description of the caterpillar and chrysalis of the latter species. It will at once be seen how widely separate the two are in their earlier stages. *Vanessa Polychloros*, L.; Caterpillar, bluish or brownish, with a lateral stripe of orange. The spines are slightly banded and yellowish. The larva feed on the willow and elm, and on some kinds of fruit trees, especially the cherry. *Encyclop. Method. Papillon.* 305. *Chrysalis*, flesh colored, with golden spots near the neck.—*ib.*

Since writing the above, yesterday, (June 6th) in company with Mr. Behrens, I paid another visit to the cañon in which we had previously found the *Vanessa*. Contrary to my expectations, the insect was far from abundant, and at least 75 per cent. of those we found were crippled in the anterior wings, while dead specimens which had never been able to take an extended flight, were scattered everywhere about our path. The females also seemed to take refuge at the roots of the dried up grass, abandoning themselves to death. Well developed specimens of both sexes flew rather rapidly, alighting very frequently, and settling on stems of trees and among decayed leaves closely

resembling them in the color of the under side. They also invariably placed themselves upon the branches with the head downwards. The insects appeared to be confined to a very small area, as we did not meet with any specimens except in the immediate neighborhood of the spot in which the caterpillars were taken. The crippled state of most of the imagos may be owing to the extremely dry state of the weather during the past month, the want of moisture acting upon the wings of the insect during their last stage, and preventing their proper development.

From the Proceedings of the California Academy of Sciences, July 19, 1875.

Pacific Coast Lepidoptera, No. 14.—Notes on the Genus *Catocala*,
with Descriptions of New Species.

BY HENRY EDWARDS.

The beautiful moths included in the genus *Catocala* are among the more interesting of the larger *Noctuidæ*, and appear to have obtained their fullest representation on the North American continent. They are natives, for the most part, of the northern temperate zone, and though some are said to exist in the Hawaiian Islands, and I am acquainted with one very large species, (a mutilated example of which was collected by the late Baron Terloo, and presented to me by Dr. H. Behr) which comes from the table land of Mexico, near Guadalajara, still the United States, Japan, N. China, Siberia, and Europe must be regarded as the home of the genus, the number of species in our own country far exceeding that of the whole of the other districts put together. According to Standinger's last catalogue, thirty-four species are found in Europe and the adjacent territories, including Siberia, four or five are known to exist in Japan, and probably the same number in Northern China, while the list of North American forms, including those mentioned in the present paper, has increased to no less than eighty-three species. In the islands of the southern Pacific and Australia are several genera which recall the coloration and structure of *Catocala*, but are separated from it by well defined limits, and it is almost certain that no true example of the genus is to be found in the southern hemisphere. Our northern States species have been recently admirably figured by Mr. H. Strecker, in his *Lepidopt. Rhopaloc. et Heterocera*, while Mr. A. R. Grote, of Buffalo, has published, in the *Trans. Am. Ent. Soc.*, Vol. 4, 1872, descriptions of the whole of those then known to him. In Mr. Grote's valuable paper he has tabulated the genus as follows:

Section 1. Secondaries black and unbanded above.

- | | | | |
|---|----|---|--|
| " | 2. | " | black above, with white median band. |
| " | 3. | " | various shades of red, with black median band. |
| " | 4. | " | orange above, with black median band. |
| " | 5. | " | black above, with narrow yellow median band. |
| " | 6. | " | yellow above, with median black band. |
| " | 7. | " | yellow above, without median band. |

It is somewhat remarkable that, with one exception, the whole of the Pacific Coast species at present known belong to the third section, viz., those which have the lower wings of various shades of red, sections one, six, and seven being entirely unrepresented. The late Baron Terloo is said by Dr. Behr to have

observed at San José, in this State, a specimen near to *Catocala relictæ* (section 2) of New England, and I myself, last year, observed in San Mateo County a very large species, with pale yellow median band, evidently nearly allied to *Catocala cerogama* (section 6). It was sitting on the trunk of a large tree of *Esculus californicus*, but, to my great regret, evaded my attempt to capture it. I could not, however, be mistaken in the color of the under wings. It is quite probable that among our oak groves many species unknown to science exist, and we may confidently hope that those of our coast now enumerated will be at least doubled in the course of a few years. It may be well to notice that these insects come readily to sugar, Mr. G. Mathew, of H. M. S. *Repulse*, being so fortunate as to capture no less than 27 specimens of *C. Aholibah*, Streck., in a single night, on some oak trees prepared by him at Esquimalt, Vancouver Island.

The following are the species at present known to inhabit the Pacific Coast :

SECTION 3.

Catocala Californica. W. H. Edwards, Proc. Ent. Soc. Phil., Vol. 2, 1864.

"Expands 2 3-10 inches.

"Primaries, dark brown, with a gray tinge, the transverse lines rather indistinct, the elbowed line with two teeth, equally prominent, and otherwise resembling *C. Marmorata*, Edw. Beyond this is a brown band, bordered by a faint, serrated, grayish line, which is edged without by black. Reniform, black; sub-reniform, brown.

"Secondaries, rosy red, nearly the same shade as in *Marmorata*. Median band, narrow, almost straight, contracting in the middle, and terminating abruptly two lines before the margin. Border, somewhat sinuous towards the anal angle. Apical spot, white, tinged with reddish. Fringe, long and white. On the under side of secondaries, the red shade occupies two-thirds of the wing. From Yreka, Cal."—W. H. EDWARDS, loc. cit.

I have two undoubted examples of this species, both, however, in bad condition, one of which was taken near Prescott, Arizona, and the other at Carson City, Nevada.

Catocala Cleopatra. Hy. Edw. n. sp.

Primaries, dark bluish gray, powdered with brown atoms, transverse lines rather indistinct, slightly olivaceous; the t. a. edged with black exteriorly, and with the indentations rather small; t. p., delicately shaded with brown and olive, with two teeth on third and fourth nervures, strongly marked with black. Reniform, indistinct, olivaceous; sub-reniform, whitish, somewhat angular, its longest angle pointing outwardly; above it, and interior to the reniform, is a dull whitish patch; and above the reniform, and touching the costa, is a strongly marked brownish shade. Submarginal line, gray, whitish and broadest towards the apex. Fringes, white, with brownish scales, except where crossed by the nervures, where they are black.

Secondaries, bright rosy red, with fawn-colored hairs at the base. Median band, moderate; broadest in the middle, not toothed interiorly, and terminating two-tenths of an inch from the inner margin. Marginal band, not broad,

except at the anterior angle, slightly sinuous as it approaches the inner margin. Fringes, broadly white, flecked with brown scales. Those of interior margin, long, dark drab, paler towards the base.

Under side. Primaries, white, with the usual black bands, the basal one oblique, shading into the median a little below the middle. Median, moderate, narrowest towards the posterior margin. Marginal band, broad towards apex, shading into fawn color at extreme margins.

Secondaries. Two-thirds of the interior portion, rosy red, as in the upper side, shading into white towards the anterior margin. Fringes, white, a little yellowish at anterior angle. Head and thorax, dark gray, mottled with brown and olive scales, whitish on the disc, where the scales form an almost triangular white mark, edged posteriorly with a black line. Abdomen, smoky brown above, paler beneath, and there dotted with fine brown scales.

Expanse of wings, 2.60 inch.

Length of body, 1.00 inch.

Berkeley, Contra Costa County, Cal. (One ♂. Coll. Hy. Edw.)

This species may easily be recognized by the bluish gray tint of the primaries, dashed with olivaceous, while the almost regular median band of secondaries recalls the European *C. pacta*, and the Atlantic and Canadian *C. concumbun*, Walk. Like all our Californian species, it appears at present to be exceedingly rare.

Catocala Mariana. Hy. Edw. n. sp.

Primaries, dark iron gray, with bluish tinge, especially towards the margins. T. a., only slightly dentate, shading into black on the costa, and terminating on the interior margin in a whitish patch. T. p., commencing at about one-third the length of costa, then running outwardly into two strong indentations, marked interiorly with black, and towards the interior margin, sinuate into a long and narrow tooth, terminating in white patch on the interior margin. Sub-terminal, whitish. Posterior margins, paler gray, with a row of well defined black dots in the intro-nerval spaces. Reniform, blackish and indistinct. Sub-reniform, open, resting on whitish space. Fringes, dull white, mottled with brownish.

Secondaries, rose color, with basal hairs and fringe of anal margin brownish. Median band, moderate, constricted in the middle, forming rather a sharp angle outwardly near its center, which is its widest part. It does not narrow into a point at its termination, but ends abruptly about three-sixteenths of an inch from the abdominal margin. Marginal band, with deeper sinuations, but otherwise resembling the previous species. Fringes, clear white, very slightly mottled with brownish. Head and thorax, iron gray. Abdomen, smoky brown, paler beneath.

Under side, as in *C. Cleopatra*.

Expanse of wings, 2.50 inch.

Length of body, 1.00 inch.

Vancouver Island. Hy. Edw. and G. Mathew.

Closely resembling *C. Cleopatra*, and the Atlantic *C. Briseis*, but differing from the former by the darker color of the primaries, the duller and more scarlet red of secondaries, and by the less regular median band; and from *Briseis*

by the broader band of secondaries, and by its abrupt termination far from the abdominal margin.

Catocala Faustina. Strecker. Lepid. Rh. et Heter., No. 3, Page 21.

"Male. Expands $2\frac{3}{8}$ inch.

"Body above, gray; beneath, white.

"Upper surface. Primaries, bluish gray, powdered with brown atoms; marginal spots, transverse lines, and bands, well defined. Reniform, distinct, and surrounded by an outer circle, which is produced in two points on exterior. Sub-reniform, white; above this, and interior to the reniform, is a white space. Fringe, light gray.

"Secondaries, scarlet. Median band, moderately wide, angulated at center outwardly, and terminating somewhat abruptly about two lines from the abdominal margin. Marginal band, with a deep indentation between the first and second median nervules. Apical spot and emarginations, rosy. Fringe, on exterior margin, white; on interior margin, gray.

"Under surface. Primaries, white.

"Secondaries. Interior two-thirds, rosy; towards costa, this color becomes lost in white; almost imperceptible indications of a discal lune."—STRECKER, loc. cit.

Arizona, Wheeler Expedition, 1871. Coll. H. Strecker. Dr. H. Behr, Nevada.

Catocala Perdita. Hy. Edw. n. sp.

Very closely allied to the last species, and, but for Mr. Strecker's assurance to the contrary, I should have considered it identical. The transverse lines, however, are heavier, and the reniform spot is more distinctly gray in color. The mesial band of secondaries is wider, and continued further towards the abdominal margin. The apices are pure white, without any tint of rose color, and the amount of red on the lower side is very decidedly less than is to be found in *Faustina*. In other respects, I can perceive no difference.

San Mateo County, Cal. (Coll. Hy. Edw.)

Catocala Hippolyta. Hy. Edw. n. sp.

Primaries, pale silver gray, the whole of the lines brownish, distinct. T. a., shaded with dark, particularly on costa. T. p., with the teeth very regular, almost in a line with each other, and of equal length. Reniform, brownish, indistinct. Sub-reniform, whitish, not connected with the t. p. line. Subterminal line, with regular teeth, but pale and rather indistinct.

Secondaries, yellowish red, same color as in *Parta*. Marginal, broad on apex, unusually narrow towards abdominal margin, where are two deep indentations. Mesial band, exceedingly narrow, widest in the middle, terminating very abruptly about two-tenths of an inch from the margin. Apices and marginations, slightly rosy. Fringe, white. Under surface, as in *Perdita*.

Head and thorax, gray, mixed with white. Abdomen, pale grayish drab.

Expanse of wings, 2.75 inch.

San Mateo County, Cal. (Coll. Hy. Edw.)

This is a beautiful and strongly marked species, the very pale gray of the primaries, and the remarkably narrow mesial band of secondaries, serving to distinguish it from any other with which I am acquainted.

Catocala Luciana. Hy. Edw. n. sp.

Primaries, brownish gray, with yellowish tinge; the whole of the lines and spots very heavy and strongly marked, shading into black on the margin. Reniform, large, blackish, surrounded by paler ring. Sub-reniform, distinct, open, fawn drab.

Secondaries, yellowish red, color of *Parta*. Marginal band, rather narrow and regular, with only slight indentations near abdominal margin. Mesial band, also narrow, widest in center, and terminating abruptly about two-tenths of an inch from abdominal margin. Apices, with an orange tint. Fringe, yellowish white.

Under surface, yellowish white; inner half of secondaries, red; the bands, all narrow.

Expanse of wings, 3.00 inch.

Colorado, T. L. Mead. (Coll. Hy. Edw.)

Catocala Irene. Behr. (Trans. Am. Ent. Soc., 1870.)

Primaries, yellowish brown, paler along the margins. The lines are all indistinct, and lost in the brown shading of the wings. T. a., almost obsolete. T. p., with two deep teeth, above the middle, directed towards the apex, and surmounted by a blackish shade. Sub-terminal line, grayish, with regular teeth. Reniform, small, brown. Sub-reniform, almost obsolete, connected with a paler shade, which touches the costa.

Secondaries, yellowish scarlet, color of *Unijuga*. Marginal band, moderate, rather deeply toothed towards abdominal margin. Mesial, rather narrow, slightly constricted in the middle, and terminating in a point about one-eighth of an inch from margin. The under side of secondaries has an unusually large proportion of red.

Expanse of wings, 2.60 inch.

Fort Tejon, Coll. Dr. Behr. Mendocino County, Cal., Coll. Hy. Edw.

Mr. Strecker expresses some doubts as to the identity of my specimen with Dr. Behr's species, (*Lepid. Rhop. et Heter.*, page 100) but, upon again carefully comparing them, I am convinced that they are alike, and in this opinion I am sustained by Dr. Behr. The species resembles *Unijuga* in the color of the secondaries, but it is much smaller, and is very widely separate in the ornamentation of the superior wings, which are browner and more confused than those of its Atlantic relative.

Catocala Marmorata. W. H. Edwards. (Proc. Ent. Soc. Phil., Vol. 2, 1864.)

"Expands 4 inches.

"Head and thorax, light gray. Abdomen, wanting.

"Upper surface. Primaries, pale gray and white, more or less powdered with dark gray or blackish atoms, and bear a superficial resemblance to the European *C. Fraxini*. Transverse lines, black. Beyond the t. p. line, a

brown band, succeeded outwardly by another, which is much narrower, and pure white. Reniform, dark, and shape not well defined. Sub-reniform, joined by a line to, not formed by, a sinus of the t. p. line. Fringe, white.

"Secondaries, scarlet, of a lovely shade. Mesial band, narrowed in the middle, and extends almost to the abdominal margin. Fringe, white.

"Habitation, Yreka, Cal."—W. H. EDWARDS, loc. cit.

Of this grand insect, apparently the largest of all known American species, I am entirely ignorant, save through the above description and Mr. Strecker's admirable illustration.

Catocala Stretchii. Behr. (Trans. Am. Ent. Soc., 1870.)

Primaries, silver gray, very distinctly mottled with black irrorations. Lines, all faint. T. a., whitish, and with very small teeth, running its length almost straight, and without deviation. T. p., also nearly straight, and with even indentations. Reniform, blackish, with a double ring, and surrounded by a dark cloud. Sub-reniform, whitish, with a fawn-colored tinge; rather small, but very distinct. Sub-terminal line runs parallel to the t. p.

Secondaries, yellowish red, paler than in *Parta*. Mesial band, very narrow, scarcely constricted in the middle, and turning into a very distinct hook, about two-tenths of an inch from the abdominal margin. Marginal band, narrow, with two small indentations near anal angle. Apices and marginations, very broadly white.

Thorax, gray. Abdomen, smoky drab.

Under side with usual bands, and half the secondaries yellowish red.

Expanse of wings, 2.85 inch.

Virginia City, Nevada, R. H. Stretch. (Coll. Dr. Behr.)

A very distinct species, of which the specimen in Dr. Behr's collection is the only one known to me. No other species has the hook of the mesial band so distinct as this, and the lines of the primaries are more regular and parallel to each other than in any other with which I am acquainted.

Catocala Aholibah. Strecker. (Lepid. Rhop. et Heteroc., Page 72.)

"Expands 3 inches.

"Head and thorax above, dark brown, with scattered white and gray scales. Abdomen, brown. Beneath, light brownish gray.

"Upper surface. Primaries, dark brown, frosted and intermixed with white and gray; a white space adjoining the reniform, inwardly; reniform, indistinct; sub-reniform, very small, white, surrounded with black, and entirely disconnected with the transverse posterior line. Secondaries, crimson, with brownish hair at the base; median band, rather narrow and regular, and continued to within a short distance of the abdominal margin, where it turns up-wards, and is lost in the brownish hair that clothes that part.

"Under surface. Primaries, crossed by three black bands, none of which join or merge with each other; the spaces between the base and sub-basal band, and between the latter and the median band, are orange colored, inclining a little to crimson at the interior margin; the space between the median

and marginal bands is white; fringe, white, with black at the termination of the veins. Secondaries, inner two-thirds, crimson, a little paler than on upper side; rest, white; marginal band, tinged with gray at and near the costa; median band terminates about one line from the abdominal margin; slight indications of a discal crescent, connecting with the median band; fringe, white.

"Habitation, California."—H. STRECKER, loc. cit.

The above description was drawn up by Mr. Strecker from a ♂ presented to him by Mr. J. Behrens. The ♂, of which two specimens are in my collection, is smaller, (2.60 inch.) the mesial band is wider, and reaches fully to the abdominal margin, while at the base of secondaries is a deep black shade, formed by the hairs covering that region. The brown mottled shades of primaries are also much darker and richer, and the lines and spots more distinct.

C. Aholibah appears to be the most common of the Pacific Coast species, and is found from San Francisco to Vancouver Island, in which latter locality it is, as I have previously stated, quite abundant. It is by no means confined to the "higher mountains of California," as Mr. Behrens formerly imagined, that gentleman having recently taken a fine specimen at Saucelito, on the shores of our bay. I have received examples from Oregon and Washington Territory.

For the purpose of comparison, I am induced to add a description of the Mexican species spoken of at the commencement of this paper:

Catocala Cassandra. Hy. Edw. n. sp.

Primaries, dull gray, clouded with black. Lines, all distinct and regular. T. a., nearly straight, and with the indentations small. T. p., slightly bent on costa, with small and regular teeth, running obliquely from its center to interior margin, wanting the usual elbowed line, and reaching the margin behind its center. Sub-terminal line, almost obsolete. Reniform, black, surrounded by a black cloud, which reaches from costa to interior margin. Sub-reniform, whitish, indistinct.

Secondaries, pale red. Mesial band, narrow; of equal width for more than half its length, then abruptly narrowed, and bending almost at a right angle to abdominal margin. Marginal band, broad at the apex, with the indentations near anal angle moderate. Apices, white, tinged with orange red. Fringe, white.

Under side. Usual bands, the mesial of secondaries terminating abruptly about two-tenths of an inch before reaching abdominal margin, and not continued to the margin as in the upper side. Inner half of secondaries, pale red.

Expanse of wings, 3.60 inch.

Guadalajara, Mexico, Baron Terloo. (Coll. Hy. Edw.)

Its large size, primaries clouded with black, and the peculiar form of the mesial band of secondaries, will serve to distinguish this from any other known species.

SECTION 4.

Secondaries, orange above, with black median band.

Catocala Zoe. Behr. (Proc. Ent. Soc. Phil., 1870.)

Primaries, rich brownish gray, mottled with white, the basal portion darkest. Across the center of the wing, reaching from the base to the t. a. line, is a black dash, surmounted by some clear white scales. The t. a. is richly clouded with black, and only slightly dentate, chiefly towards the interior margin. T. p., black, with two large central teeth, and four smaller ones, of equal size, running towards the interior margin. The sub-terminal line is clear white, with the indentations small and regular. Reniform, large, whitish, surrounded by a double ring. Sub-reniform, very small in the ♂, large in ♀, open, and in the latter sex joining the t. p. line. Fringes, gray, mottled with brown.

Secondaries, bright orange, clouded at the base by brownish hairs. Mesial band, narrow, broadest in center, much constricted near abdominal margin, and there turned upwards, reaching the margin about its middle. Marginal band, moderate, very deeply bi-dentate near the anal angle. Apices and margins, deep buff. Fringe, dirty white, alternated with brownish black.

Head and thorax, gray, mottled with white. Abdomen, smoky fawn color.

Under side. Usual bands, the lighter ones of primaries being largely suffused with orange, and the same color occupies nearly two-thirds of the secondaries.

Expanse of wings, 2.50 inch. ♂, 3.05 inch. ♀.

Napa and Marin Counties, Cal. Vancouver Island. (Coll. Dr. Behr. H. Strecker. Hy. Edw.)

This species very closely resembles both *C. Ilia* and *C. innubens* of the Atlantic States, but differs materially from both in the paler color of the secondaries and by the more deeply toothed marginal band. The shading of the primaries very nearly approaches that of *Ilia*, but the lines are clearer, and more decidedly mottled with white.

It will thus be seen how very small is our present list of *Catocala*, compared with those of the Atlantic States, and yet, as the plants on which the caterpillars feed, viz., oaks, willows, and poplars, are common throughout the State, we might reasonably look for an abundant harvest of species. Perhaps more collectors in the field, and a determined and energetic search for them in their haunts, will yield us a larger number of these beautiful moths, which at present, not alone in species, but also in individuals, may be ranked among the greatest of our entomological rarities. The following are noticed in this paper, the names of those which I have described as new having been derived from the heroines of Shakespeare's plays:

<i>Catocala Californica</i>	W. H. Edw.
“ <i>Cleopatra</i>	Hy. Edw. n. sp.
“ <i>Mariana</i>	Hy. Edw. n. sp.
“ <i>Faustina</i>	Strecker.
“ <i>Perdita</i>	Hy. Edw. n. sp.

<i>Catocala Hippolyta</i>	Hy. Edw.	n. sp.
" <i>Luciana</i>	Hy. Edw.	n. sp.
" <i>Irene</i>		Behr.
" <i>Marmorata</i>	W. H. Edwards.	
" <i>Stretchii</i>		Behr.
" <i>Aholibah</i>		Strecker.
" <i>Cassandra</i>	Hy. Edw.	n. sp.
" <i>Zoe</i>		Behr.

1871

1. The first of the following is a list of the names of the persons who have been admitted to the office of the Secretary of the Board of Education since the last meeting of the Board.

2. The second is a list of the names of the persons who have been admitted to the office of the Secretary of the Board of Education since the last meeting of the Board.

3. The third is a list of the names of the persons who have been admitted to the office of the Secretary of the Board of Education since the last meeting of the Board.

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10. The tenth is a list of the names of the persons who have been admitted to the office of the Secretary of the Board of Education since the last meeting of the Board.

Pacific Coast Lepidoptera, No. 15.—Description of a new species of *Catocala*, from San Diego.

BY HENRY EDWARDS.

Catocala Augusta. n. sp. Hy. Edw.

Primaries. Ground color, very pale fawn-color, almost whitish. All the lines, particularly the sub-terminal, strong and distinct. Basal space, rather large, covered with black irrorations; basal half-line, almost obsolete. T. a., broad on costa, with a double tooth; thence slightly arcuate to a space beyond the middle, there forming a deep tooth, and bent again to the internal margin. This line is deep velvety black, edged anteriorly by a whitish shade. T. p., with a deep median double tooth, running obliquely from the median nerve to the internal margin, in a series of four teeth, and near the margin lost in a brownish shade. Reniform, large, distinct, whitish, edged with black. Sub-reniform, also, large and white, both with grayish shade posteriorly. Sub-terminal line, very strongly marked, with deep but even teeth, edged anteriorly with gray shade. Sub-terminal spots between the nervules, well defined, oblong, deep black. Fringes whitish, mottled with brown.

Secondaries. Rosy red, with yellowish tinge. Mesial band, moderate, almost straight inwardly until it reaches the middle, when it narrows and terminates about $2\frac{1}{2}$ lines from abdominal margin. Marginal band also moderate, with two rather prominent teeth near the anal angle. Apices, broadly yellow. Emarginations and costa, also, with yellow shade. Fringes, white. Abdominal margin, clothed with fawn-colored hairs.

Underside. The black bands of primaries are very broad; the white ones very clear and distinct; the sub-basal one not reaching the interior margin; and the posterior one much wider on the costa than on the internal margin. Secondaries, two-thirds pale yellowish red, the mesial band narrower than on the upper side.

Expanse of wings, 3.30 inch.

Locality, San Diego, Cal. Mrs. Jas. Behrens.

The upper wings of this beautiful species recall the shade of the European *C. Fraxini*, but they are still paler in color, and with the lines even more distinctly marked. Its nearest ally is *C. Luciana*, Hy. Edw., from Colorado, but it differs from that species by its paler gray color, by the reniform and sub-reniform being whitish instead of black, by the lines being more deeply and regularly toothed, and by the extreme distinctness of the sub-terminal line. The color of the secondaries have also a more rosy tint than those of *Luciana*.

For this interesting addition to our insect fauna, we are indebted to Mrs. James Behrens, who has frequently added great rarities to her husband's collection, and to whom, through the medium of her given name, I have great delight in dedicating it. Mrs. Behrens took two specimens of this charming insect in August last, in the neighborhood of San Diego.

THE LANCET LEPIDOPTERA. No. 15. Description of a new
Species of *Lepidoptera* from the Tropics.

By J. H. H. H.

(Lepidoptera: Noctuidae.)

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From the Proceedings of the California Academy of Sciences, April 19, 1875.

Pacific Coast Lepidoptera.—No. 16. Notes on the Transformations of some Species of Lepidoptera, not hitherto recorded.

BY HENRY EDWARDS.

With the desire to add, little by little, to the knowledge of our species of Lepidoptera, I think it of importance to present to entomologists every observation which I am enabled to make with reference to their transformations, and though in some instances I am only able to give notes of the egg, in others, of the early larval stage, and still in others, of the more mature conditions, I regard these as of extreme value in assisting to perfect our knowledge of the life-history of each species, and as an aid to other workers who may have opportunities different from my own. As the paleontologist can, from the fragmentary portions of extinct animals, sometimes obtained from regions remote from each other, build up a complete description of the species under his consideration, so do I hope that these incomplete studies may aid the future student of the habits and history of our yet slightly known insects, and thus become the foundation upon which a better superstructure may be raised. The whole field of research in this department is yet untraversed, and will amply repay the investigator in this most interesting branch of natural science, and as before, I entreat those into whose hands examples of the early stages of any of our insects may fall, to omit no opportunity of making known to myself, or others engaged in entomological pursuits, the results of their observations.

Since the publication of my last paper on the transformations of our Lepidoptera (No. 14), the following species have come under my notice:

Family PAPILIONIDÆ.

Papilio Philenor. Fab.

Chrysalis. The usual color of this stage of *Philenor* has been a grayish stone color, mottled with violet and yellow; but from two caterpillars found feeding, in June last, on *Aristolochia* at Saucelito, I have obtained chrysalides so different in color, as almost to suggest another species. They are pale, but vivid, yellowish green, of a very lively tint over the whole surface, which is covered with minute blackish reticulations. The edges of the wing cases, abdominal tubercles, apex of the mesonotal process and edges of the antennæ cases rich purplish brown. Out of the same brood of thirteen caterpillars, eleven assumed the normal coloring. They all went into the chrysalis state from June 28th to July 17th.

Fam. NYMPHALIDÆ.

Limenitis eulalia. Bdv.=*Californica*. Buller.

Larva. General color, pale greenish or fawn color, becoming entirely of the latter tint when about to undergo its change. Body covered with small whitish spines. Head rather large, edged on its margins with a row of slightly branched whitish spines, each tipped with black; 2d segment constricted, without spines; 3d, 4th, 6th, 11th and 12th, each with a pair of long and branched spines, tipped with black; 7th, 8th, 9th and 10th, with shorter pair of similar spines. Below the spiracles, which are fawn color, is a darker line. Feet and legs concolorous.

Length, 1.20 inches.

Food plant, *Quercus Douglassii*, *Quercus Sonomensis*.

Chrysalis. The specimens from which my first description was taken (Proc. Cal. Acad. Sc., Vol. V, Part II) differed from the present one, in that the latter had a most beautiful pale golden blotch over the whole region of the wing cases. This chrysalis was semi-transparent, ash gray or drab, and was attached to the under side of the oak leaf by strong silken threads; the whole of the surface of the leaf being covered by the web.

Changed to chrysalis, August 20th. Imago, September 3d.

Fam. LYCENIDÆ.

Lycæna antægon. Bdv.

Larva. Head small; dark brown. Body dirty yellow, covered with very short downy hairs; a few black spots irregularly scattered, and a narrow greenish dorsal stripe. Spiracles, small; dark brown.

Length, 0.50 inch.

I am indebted to Dr. Behr for an opportunity of observing the larva; specimens having been found by Mr. Graham, one of Dr. Behr's students, feeding in the pods of *Astragalus*.

Fam. SPHINGIDÆ.

Deilephila daucus. Cram.=*Lineata*. Fab.

Larva. Mature. General color pale apple green. Head and 2d segment with more olivaceous tint, thickly dotted with greenish white warty spots. Mouth parts, dull yellowish. There is a bright green dorsal line, varying much in width in different individuals; sometimes merely a line, at others occupying nearly the whole dorsal surface. This is uneven at its edges, which merge into black subdorsal lines, enclosing a bright yellow streak. Both the black and yellow lines are widest anteriorly, the latter in some specimens becoming an orange patch. Posteriorly on the black lines are some small yellow dots. Caudal horn dull yellow, rough, black at the tip. Anal segment similar to the head. Spiracles orange, surrounded by a black patch, in which are some small yellow dots. Above the feet, which with the legs, are dull yellow, are some waved black lines, occasionally obsolete.

Variety. After the fourth moult, the caterpillar sometimes, but only rarely,

assumes a very strange appearance. It becomes quite black, every trace of green being lost. The head and anal segment are then bright chestnut brown, with paler dots; while the feet and legs are dark orange. There is a faint trace of a yellow subdorsal line, and the spiracles are dark orange, with a faint lateral line below them. Between their extremes are many varieties of color.

Chrysalis. Very long and cylindrical; light chestnut brown, Tongue case wanting. Head and wing cases entirely without irrorations. Abdominal segments darker posteriorly, very rough, and dotted with darker points. Spiracles large, ovate, dark brown.

Length, 2.10 inches Width, 0.40 inch.

The caterpillar feeds on *Rumex*, *Epilobium*, *Pelargonium* and *Fuschia*. To the last named garden plants, it is extremely destructive. It is full-grown in June; changes to chrysalis from that month to the end of July, burying itself rather deeply in the ground. The perfect insect appears from August to October. It is quite common in gardens throughout this State.

Smerinthus ophthalmicus. Bdv.

Egg. Deposited separately on the food plant. Ovate, cream yellow, very smooth and shining, surrounded by a ring of lake red color. Before the exclusion of the larva, the eggs change to a pale, and afterwards to a dull greenish blue, the reddish ring being lost. Deposited, July 20th, on willows.

Young Larva. Emerged July 28th. Very pale yellowish green. Head very large, almost monstrous, and of a darker shade. Caudal horn pinkish brown, darkest at the tip. After the second moult the oblique yellow stripes make their appearance, and there is then little change save in size, until the

Mature Larva. General color pale apple green. Head rather large, truncate in front, pyramidal, the two sides of the angle broadly and distinctly edged with bright yellow, and enclosing a corrugated space, darker green than the rest of the body. Mouth parts, and feet reddish brown. The whole of the segments are marked with whitish tubercular dots. Along the sides is a narrow stripe of pale yellow, and from the 4th, 5th, 6th, 7th, 8th, 9th and 10th segments proceed some oblique yellow stripes, the 10th being the broadest, and continued to the junction of the caudal horn, which is dull sky blue, the extremity black. The anal segment is also edged with yellow. Spiracles white, edged with reddish brown. Abdominal legs, dull apple green.

Apparently double brooded, as I have taken fresh specimens of the perfect insect in February and March, while the specimens from which the above description is drawn, went into chrysalis in July, the moth emerging in the middle of September.

Fam. BOMBYCIDÆ.

Halesidota Edwardsii. Packard.

Egg. Laid in irregular clusters. Ovate, slightly flattened at the apex, and often forced out of its regular shape by a large mass being crowded into the fissure of the bark chosen as the place of deposition. Color, dull yellow, paler on the upper half, and there slightly transparent. There is no apparent sculpture, the whole surface being quite smooth and shining.

The young larvæ, which are quite black, with very long hairs, appeared on May 5th, the eggs having been deposited on April 24th. The mature form of the larvæ is described in Stretch's "*Zygæindæ and Bombycidæ of North America*," page 88.

Spilosoma vestalis. Packard.

Egg. Laid in compact masses upon the food plant. Color, cream white, surface slightly wrinkled, the wrinkles when viewed through a powerful lens appearing to be a series of punctures. Eggs deposited May 15; larvæ emerged May 21st.

Young Larva. On exclusion from the egg the larvæ are dirty greenish black, with the head large, and the hairs remarkably long. After second month, the body becomes whitish green, with the head slightly pitchy. The 2d, 3d, 4th, 6th, 7th, 8th, 9th and 10th segments have four small blackish tubercles, armed with whitish spines laterally, and blackish ones dorsally. The 5th and 11th segments have still larger black tubercles. The dorsal region is darker than the sides, which generally have a yellowish tint. Feet and legs, greenish white. After the third month, the whole of the lateral hairs become bright chestnut brown, almost deep orange; those of the dorsal region darker brown, and beyond the 4th segment anteriorly, and the 10th posteriorly, the hairs of the dorsal tubercles are black; the tubercles also become hidden by the hairs. Subsequent to the fourth moult, the whole of the dorsal hairs are largely and broadly black, and the lateral series bright chestnut brown. In this condition, the larva may be readily mistaken for that of *Spilosoma acraea*.

Mature larva. Body slate black, glossy. Dorsal bunches of spines, rich velvety black; those of the lateral region, bright chestnut brown; underside, ash color. The spines are all very glossy and rich in color.

Length, 1.75 inch.

Food plant, various sp. of *Lupinus*.

The larvæ were fully fed in the early part of July, being exceedingly voracious, though able to exist for four or five days without food, and suffering no apparent inconvenience. About the 10th of the month, they began to spin cocoons, mixing up with their webs the remains of leaves and stems of their food, the whole of eleven larvæ which I carried successfully to their last stage, changing almost on the same day to the condition of chrysalis. The perfect insect is usually met with in April, and in warm seasons as early as March.

Pseudohazis eglanterina. Bdv.

Egg. Ovate, stone color, agglutinated together, and arranged in a compact mass around the stem of the food plant, generally near the extremity of the branches. The eggs are attached by their smallest end, the larvæ, escaping from the apex.

Mature Larva. Head black, shining, with a few short, brownish hairs. Body entirely dull black. Each segment is armed with six lateral spines, very finely branched, and two dorsal fascicles of spines, bright chestnut color, blackish in the centre. The branchlets of the spines are all bright

chestnut color. Underside, as well as the feet and abdominal legs, dull black.

Length, 2.00 inches.

Food plants, *Frangula Californica*, and various species of *Rosa*.

Hemileuca Nevadensis. Stretch.

Head shining, reddish brown. Body, pale citron yellow; 2d segment with reddish brown transverse streak, armed anteriorly with six black spines, having pale yellow branches; 3d, 4th, 5th and 6th segments, each with eight spines; 7th, 8th, 9th, 10th and 11th, have six spines each; 12th and 13th, only five, the middle one of the last being placed posteriorly to the other four. The whole of the lateral spines, as well as those of the 13th segment, are black, with pale yellow branches. Those of the dorsal pair of segments, three to eleven inclusive, are dull yellow, mottled with black, as is also the medium bunch of spines of the 12th segment, giving, when viewed without a lens, the appearance of a yellow dorsal line. There is a narrow central line of reddish brown, and each segment is also marked with transverse streaks of the same color, which, on the sides, become a broken but well defined band. Spiracles, orange, edged with reddish brown. Feet and legs also reddish brown, and segment tipped with the same color.

Length, 2.00 inches.

Food plant, Willows.

The above description is taken from one of several caterpillars, obtained in Fresno Co., Cal., by Dr. Eisen, and by him forwarded to Dr. H. Behr. In the description of the larvæ of *H. Maia Drury*, I find a notice of two reddish tubercles on each segment, which are entirely absent in the present species. In other respects they are much the same. *Maia* generally feed on oaks, while this was invariably found upon willows, and fed in confinement upon the weeping willow of the gardens.

Fam. NOCTUIDÆ.

Acronycta lepusculina. Grote.

Mature Larva. General color of body pale bluish green. Head a little paler. Mouth parts and prolegs deep black. Spiracles black, with whitish centre. The whole of the body is covered with very long silky white hairs, $\frac{3}{10}$ of an inch long, with some shorter black ones mingled, chiefly in the dorsal region. Abdominal legs bluish green.

Length, 1.10 inch.

Food plant, Poplars.

Changed to chrysalis July 23d; Imago, September 26th.

Drasteria erectho. Bdv.

Egg. Spherical, a little flattened at the poles; color, pale apple green, deeply striated, but with the striæ not reaching to the apex. Spaces between the striæ transversely rugged. Deposited separately on leaves of *Lupinus* and *Erodium*.

Fam. GEOMETRIDÆ.

Cidaria, 4-punctata. Packard.

Head and 2d segment, dull rose pink, the same color being continued broadly along the sides. In the lateral region are some small white dots. Dorsal region and underside, bright apple green, each segment tinged indistinctly with dull orange yellow. Feet and legs, dull rose pink.

Length, 1 inch.

Food plant, *Fuschia*; the stems of which plant are wonderfully mimicked in color by the caterpillar.

Chrysalis. Light brown, paler at the junction of the segments, each of which bears a transverse row of minute concolorous hairs.

Length, 0.60 inch.

Spins a very thin web on the underside of the leaf, which is slightly rolled at the edges.

Changed to chrysalis, June 25; Imago, August 4.

LIST OF SPECIES NOTICED IN THIS PAPER.

<i>Papilio Philenor</i>	Chrysalis.
<i>Limnitis Californica</i>	Larva and Chrysalis.
<i>Lycæna antægon</i>	Larva.
<i>Deilephila daucus</i>	Larva and Chrysalis.
<i>Smerinthus ophthalmicus</i>	Egg and Larva.
<i>Halesidota Edwardsii</i>	Egg.
<i>Spilosoma vestalis</i>	Egg and stages of Larvæ.
<i>Pseudohazis eglanterina</i>	Egg and Larva.
<i>Hemileuca Nevadensis</i>	Larva.
<i>Acronycta lepusculina</i>	Larva.
<i>Drasteria erectho</i>	Egg.
<i>Cidaria</i> , 4-punctata.....	Larva and Chrysalis.

Pacific Coast Lepidoptera.—No. 17. On the Transformations of *Colias* (*Meganostoma* Reak) *Eurydice*, Bdv.

BY HENRY EDWARDS.

Some five years since I observed that the females of this rare and beautiful butterfly were in the habit of hovering over the singular Leguminose plant, *Amorpha californica*, Torrey, and upon one occasion I thought I detected one in the act of laying her eggs, but the most careful search for such demonstration, though followed over the whole bush by the aid of a pocket lens, failed to establish the fact, and I believed that I had been deceived, and that the food-plant of the species must be sought for elsewhere. Two years ago, however, the same circumstances re-occurred, and in this instance I noticed six different females alight upon bushes of *Amorpha*, and proceed as insects usually do in the process of the deposition of eggs. I again searched these bushes, and again without success, and I was led to the somewhat wild conclusion that the eggs are deposited at random, and allowed to drop to the ground at the base of the plant; the instinct of the parent trusting to the power of the young larva to find its proper food, when, after its winter sleep, the plant should put forth its spring adornment. The *Amorpha* is particularly local, and not easy of cultivation, so I had no means of following up my observations but by traveling some miles to the spots in which the plant happens to grow, and these being at a distance of from 30 to 100 miles from San Francisco, the opportunities afforded me were but few. Every season, however, I followed up the small trail which I had struck, and this year I was fortunate enough to have my hopes of the discovery of the earlier stages of this charming species crowned with complete success, and at White Sulphur Springs, Napa Co., on the 7th of May last, I had the extreme gratification of seeing the caterpillar for the first time. Upon some plants of *Amorpha*, which very specimens I had carefully searched for five years, I found 19 examples in different stages of growth, and have since had the satisfaction of seeing all transform to the chrysalis state, and some few reach the imago. The species appears to be as delicate in physical habit as its colors are beautiful, and it feeds exclusively upon the plant on which it was originally found. I tried the caterpillars with *Psoralea*, *Astragalus* and *Hosackia*, among Californian plants, and with *Cassia* and *Swainsonia* among exotics, but it would eat none of them, and no matter how dry the leaves of its own food might be, it devoured them readily, and appeared to thrive. The result of my first experiment with this species has been as follows:

The full grown larvæ began to change to the chrysalis on the 9th of May, and by the 14th all had gone into that stage, the first imago emerging on the 28th. I should add that in addition to the 19 nearly full grown larvæ which I brought successfully to the chrysalis state, I found four younger ones, two of which had scarcely passed the second moult, the other two being a little

older. The whole of these, however, died soon after my reaching home. I have raised out of my 19 caterpillars seven males and four females, seven of the remainder dying in the chrysalis stage from some singular disease. Without any mark to proclaim any kind of sickness, about the third or fourth day after the transformation a livid spot appeared upon the base of the abdominal region, and in two days more this was extended to the whole surface. By the end of the 10th day the chrysalis had assumed a blackish hue, and withered completely away, leaving only the dry husk to tell the tale. No parasite has emerged from these specimens, nor does it appear likely that any such event may happen, as the remaining specimen was infested by a large Dipterous insect, common to many species of Lepidoptera, which has already produced its imago. I regret that a knowledge of the egg has so far escaped me, but I hope to be able to furnish this fact before the close of the year. Mr. R. H. Stretch was kind enough to make a figure of the larva and chrysalis, which will be published in Mr. W. H. Edwards' exquisite work on the Butterflies of North America. In the meantime I offer the following description:

Larva. General color, pale yellowish green. Head, rather small, bluish green, with a few short hairs in front. Body entirely covered with minute black irrorations, with a faint indication of a pale dorsal stripe. There is a very distinct white lateral stripe enclosing the spiracles, which are bluish white, and are surrounded by a yellow dash. Above the spiracles are ten well-defined black spots, around which the irrorations are thicker, forming a black cloud. Underside, entirely whitish green.

Length, 1.45 inch.

Food plant, *Amorpha californica*, Torr.

Chrysalis. Entirely pale yellowish green, surface slightly wrinkled, the dorsal region covered with white specks. Beak very sharp, and broadly keeled. Thoracic protuberance a long, acutely-edged ridge. The yellow dorsal line is visible as in the larva. When the imago is about to emerge, the wing cases assume a darker shade, until the pattern and color of the primaries of the perfect insect may be gradually and distinctly seen. After emergence, the chrysalis case is pure white, and very transparent and glossy.

Length, 0.95 inch.

Width across wing cases, 0.28 inch.

First imago appeared May 28th, the last on June 5th, the average time in chrysalis state being 19 days.

[From the Proceedings of the California Academy of Sciences, October 16, 1876.]

Pacific Coast Lepidoptera.—No. 18. Description of a New Species of *Heterocampa*, (Larva and Imago).

BY HENRY EDWARDS.

The following interesting species was detected by me in the fall of last year, feeding upon willows, in the neighborhood of Mt. Shasta, making the second of the genus now known to inhabit California:

Heterocampa salicis, n. sp. Hy. Edwards.

Larva, Mature. Ground color, bright golden yellow with subdorsal, longitudinal bands of clear white. Head, bright vermillion red, rather small, grooved in centre, with a small fovea in front. Second, third, and fourth segments, with broken black lines, those on the sides occasionally edged with white, each segment with two long spinous tubercles. Fifth segment, bright vermillion red, much swollen dorsally, and bearing eight spinous tubercles. The remaining segments are all striped longitudinally with slightly waved black lines, broken up on the sides into a series of dots. Anal segment, with ten warty spinous tubercles, without white, and all the lines obsolete. Feet and legs, yellow, spotted with black. Mouth parts, black. Spiracles, very small, black. Each of the warty tubercles is furnished with a single dirty white hair.

Length, 1.25 inch.

Six caterpillars taken, all feeding close together, upon a dwarf willow, their brilliant colors giving to the plant at a little distance the appearance of a raceme of showy flowers. In a few days they began to undergo their change, and by the 27th of August had all transformed. The cocoon is formed of very close, fine, glossy silk, the leaves of the plant being drawn around it so as to conceal it entirely. It is almost egg-shaped, and very symmetrical.

Chrysalis. Short, broad, bright, chestnut brown, very glossy and shining, the abdominal portion showing the few hairs of the larval tubercles.

Length, 0.65 inch.

The perfect insects began to appear on the 22d of December, a second followed on the 9th of January, and the third on the 16th of March. The remaining specimens all died in the chrysalis state.

Imago. Head and thorax, clothed with dense iron gray hairs, the latter towards the base changing into rich chestnut brown, mottled with fawn-color. Abdomen, stone drab, paler at the base, with the anal tuft fawn-color. Antennæ, with the shaft stone drab, the pectinations yellowish brown.

Primaries. Pale fawn-color, densely clothed with white scales, scattered somewhat irregularly, thickest towards the costal edge, and there forming an imperfect streak. Inner margins, darker, and with rich brown blotches, continued faintly to the posterior angle. At the base of the wings is also a conspicuous, somewhat sagittate patch of the same rich brown color. Fringes, white, mottled with brown. Secondaries, whitish drab, with brown markings near the anterior margin, and a brown blotch near the anal angle.

Underside. Dull whitish drab, shading into brown on the costal edge of both wings. Fringes of primaries, mottled with brown; of secondaries, pure white.

Expanse of wings, 1.55 inch.

This species differs considerably from its congener (*Het. conspecta*, Hy. Edw., Proc. Cal. Ac. Sci., Sept., 1874) in its more irregular markings, in the absence of any defined bands or spots, and in the darker base of the primaries. Both species appear to be rare, and are as yet known only by the specimens in my collection.

[From the Proceedings of the California Academy of Sciences, November 3, 1876.]

Pacific Coast Lepidoptera.—No. 19. Notes on a Singular Variety of the Larva of *Halesidota Agassizii*. Packd.

BY HENRY EDWARDS.

It has generally been conceded by entomologists that variation of certain characters in either of the stages of insect life, so long as that variation is contained within what has been called the "well defined limits of a species," does not constitute a ground for founding new species upon trivial differences. But *remarkable* changes in the larvæ of certain forms are decidedly the groundwork upon which other ideas may arise, and are the beacons which light us to a better understanding of the laws which govern the many developments of animal life, which, with their almost countless variations, lead us to the conclusion that our positive knowledge of what really constitutes a species is very limited in extent, and compel us to the confession that we can say but little as to where a species is true to its original type, or how far its wanderings may extend. It is a singular fact that the genus *Halesidota* should present two kindred instances of the variation of the larval stage to such an extent as almost to warrant the assumption that new species had in these cases begun to assert their existence; but it is nevertheless so, the one to which I am about to refer being even more remarkable than that spoken of by the late Mr. B. D. Walsh, in Proc. Boston Soc. Nat. Hist., Feb., 1864, and further alluded to by him in the Proc. Ent. Soc., Phil., Nov., of the same year. To those who are not familiar with Mr. Walsh's papers, it may be briefly stated that he found feeding upon oak some larvæ of this genus, differing very much, both in color and in the arrangement of the pencils of hairs, from those of the well known Atlantic species, *H. tessellaris*, but which, upon arriving at their perfect state, could not possibly be distinguished from the imagos of that species. Mr. Walsh, regarding the larval condition as of equal value with the subsequently matured form, called his new discovery by the name of *H. Antiphola*, and always referred to it as a phytophagic species, and not a phytophagic variety. Mr. Grote, on the other hand, in Proc. Ent. Soc., Phil., December, 1864, alludes somewhat slightly to Mr. Walsh's experiments, and considers the *Antiphola* of the latter author as merely an accidental variety of the better known and more abundant form; and this, it is but fair to say, is the conclusion arrived at by most other entomologists. It gives me great pleasure to be able to add some few facts bearing upon this interesting question, and to present the description of some larvæ, which, at the time of their capture, certainly appeared to me to be those of a totally new and undescribed species, but which, in their imago condition, can in no possible character be distinguished from the well known California species, *H. Agassizii* of Packard,=*Phæoptera salicis*, Bois.

My specimens were taken by myself in August, 1865, in Strawberry Valley, near Mount Shasta, one of them feeding upon alder (*Alnus viridis*), and the other upon a species of willow. For the better comparison of the singular differences in the larvæ, I subjoin, in parallel columns, the description of both:

Hal. Agassizii.

Head, body and prolegs, entirely black. Abdominal legs, dirty yellow. Body, slightly depressed, with the three anterior and three posterior segments evenly clothed with velvety black hairs, out of which spring some pencils of white hairs, much longer than the general clothing of the body. The middle segments are clothed with very bright lemon yellow hairs, with a black lozenge-shaped patch in the middle of each segment. In some specimens the yellow extends further, both anteriorly and posteriorly, the black hairs being consequently less; but there is little or no change during the growth of the larva, save in size, the colors being quite similar through the successive moults.

Hal. Agassizii. Var. *Alni.* Hy. Edw.

Color of body, cream white, except the head, which is jet black. Bundles of hair of the same form and arrangement as in *H. Agassizii*, but wholly of a beautiful cream white, concolorous with the body of the caterpillar. Down the middle of the dorsal region, is a row of oblong, bright red, almost vermillion, lozenge shaped bundles of hair, wanting on first, second, third and anal segments.

Length, 1.00 inch.

Previous to the last moult, the caterpillars became very dull in color, and the subsequent condition was seen through the larval skin prior to its exclusion. The appearance then presented was much closer to the usual form of *H. Agassizii*, but with a few striking differences. The body was now wholly slate black. Head, jet black, shining. Mouth parts, black, with a streak of cream color above them. 2d, 3d, 4th, 5th, 9th, 10th, 11th, 12th and 13th segments, as in *H. Agassizii*, clothed with jet black hairs, with long white pencils interspersed. The middle segments, that is, the 6th, 7th and 8th, are bright golden, and not lemon yellow, without any black hairs whatever. Thoracic legs, black; abdominal, dull yellow.

It will thus be seen that the great difference of these larval forms consists in the stages previous to the last moult, the typical one being then lemon yellow, with black extremities, and black dorsal hairs, while the other is cream white, with vermillion dorsal hairs. Moreover, the last moult of my new variety is apparently specifically different from the normal form, the yellow being a much deeper and richer tint, and the black bunches of dorsal hairs being utterly wanting. It may be well to state that *H. Agassizii* feeds exclu-

[From the Proceedings of the California Academy of Sciences, November 20, 1876.]

Pacific Coast Lepidoptera, No. 20. Notes on the Case-Bearing Moths, (*Psychidæ*), with notices of Californian Species.

BY HENRY EDWARDS.

Among the whole of the insect races perhaps there are no more curious and interesting examples than are to be found in the family *Psychidæ*, the species of which, in the early stages of their growth, weave habitations for the caterpillars of fragments of stick, bark, lichens and other vegetable substances, carrying these singular structures about with them through the whole of their larval stage, and, in the case of the female, arriving at maturity, bringing forth her eggs, and eventually dying without once quitting her self-constructed prison. The *Psychidæ* are a portion of the great silk-spinning family of the *Bombycidæ*, but present many characters which are distinct in themselves, and entitle them to rank, as they are now by most entomologists allowed to do, as a separate and well-defined tribe.

Though containing comparatively few genera and species, they have a wide geographical distribution. Examples of the group are to be found in Europe, North and South America, West Indies, Mexico, Ceylon, Northern India, China, South Sea Islands, and Australia, being most abundant in the subtropical regions of the globe. Many of the species are, however, small in size, and it is possible that a very large number yet await the industry of observers.

In the construction of the caterpillar cases, they manifest wonderful ingenuity, and their houses are even more remarkable than those of the well-known caddis-flies among the *Neuroptera*. Pieces of bark, leaves, straws cut to a uniform length, twigs, mosses, lichens and grass, form, among the various species, the outer covering or decoration of the home, while the interior is lined with dense soft silk, the threads of which are also used to bind together the external fragments. Almost as soon as the larva is hatched from the egg, it begins the formation of its case, never quitting its habitation as it enlarges in size, but splitting it at the sides, weaving into the opening portions of the vegetable matter chosen and adding to the exterior larger pieces of stick, straw or leaves, as the case may be. "While the creature is small, and the house of no great weight, it is carried nearly upright, but when it attains size and consequent weight, it lies flat, and is dragged along in that attitude." The abdominal legs are furnished with a series of strong hooks, by which the larva retains so firm a hold of the interior of its tube that it is impossible to remove it without injury. When feeding, only the head and the first three or four segments are protruded, and if the caterpillar wishes to remain quiet, it fastens itself by strong silken threads to the branch on which it may chance to be; these threads, on a desire for removal, being bitten off close to the case.

It has the power of turning round inside of its case, and when full grown,

and about to change to the chrysalis state, it places its head downward, so that when the perfect insect is ready to emerge, it may do so from the posterior portion of the tube. And it may here be said that it is the male alone which escapes from its curious habitation. The female is, in most of the genera, totally unprovided with legs or wings, and is little more than a living bag of eggs, looking, as one author has said, "more like a grub than a moth, the head, thorax and abdomen being hardly distinguishable from each other." Her eggs are laid within the body of the tube, after which operation she dies, the first occupation of the young caterpillars being to consume the body of their mother, "a proceeding almost exceptional in the lepidopterous insects." Having done this, they leave their early home and go forth into the world to follow independent lives.

The males emerge from the chrysalis state in about three weeks, and are dull-looking moths of dark color, generally unattractive in appearance, having the antennae in some cases deeply pectinated only at the base, and, in others, feathered throughout the whole length. They are remarkably swift in their flight, dashing themselves, in search of the females, wildly among the branches of the trees, and as their wings are delicate in structure, in many species nearly transparent, specimens in good order are very rare in collections.

The typical genus *Psyche* is mostly confined to the Old World, some forty species being there known to naturalists. The most striking examples of the group, however, in which the larva cases are sometimes four or five inches in length, belong to a genus named *Eceticus*, of which a species named *Eceticus Saundersii* is found abundantly in the West Indies, feeding upon fruit trees, and at times causing considerable damage. A closely allied form is common in Sinaloa, Mexico, some of the tubes of which, together with about sixteen species of *Psychidæ* from various portions of the globe, I have the opportunity of exhibiting this evening. I have, however, in my collection many of the cases, the perfect insects of which are unknown to me, and I may here mention that in confinement it is, from some cause or other, almost impossible to bring these creatures to maturity. During my residence in Australia, one species which, in its caterpillar state, was common upon the *Leptospermum lanigerum* (the tea-tree of the colonists), though persistently collected through several years and watched with incessant care, never reached the perfect stage, and to this day the imago is unknown to me. Nor was this due to the attacks of parasitic insects, as the substantial and somewhat formidable looking houses of the larva rendered them almost impervious to the onslaughts of ichneumons and other insect enemies. Death usually occurred after the caterpillar had undergone its change, the chrysalis gradually drying up after assuming its proper form, nor could any care and attention which I was able to bestow avert this misfortune.

Owing to the resemblance which exists between these remarkable insects and the fasces which were borne before the dignitaries of ancient Rome, one species has been termed the lictor-moth, while others are known as house-builders, sack-bearers, basket-carriers, and like appellations. According to the Rev. J. G. Wood, "the Singalese call them by a name which signifies billets of wood, believing that the insects were once human beings who stole

firewood while on earth, and are forced to undergo an appropriate punishment while in the insect state."

The species at present described as natives of the United States are very few, not more than five belonging to perhaps as many genera, being distinctly known to entomologists. The most common of these is a species called *Thyridopteryx ephemeriformis*, which, according to Dr. Harris, is occasionally abundant in Philadelphia and its vicinity, and there popularly known in its larval state as the drop-worm or basket-worm. It is at times very destructive to the arbor-vitæ, larch and hemlock trees. In California, though none as yet have been described, three species are known to me, two of which belong to the typical genus, *Psyche*; the third, and by far the most interesting, which has just been discovered by our President, Prof. Davidson, representing the genus *Æceticus*. It is, however, a matter of regret that at present the caterpillar cases of these three species are alone known, the perfect insects as yet evading our discovery.

Though, perhaps, not quite in order to give names to insects from their earlier stages alone, I am induced to offer brief descriptions of these curious creatures, and to suggest the names appended to them, in the hope that I may, by directing attention to the subject, induce observers in various portions of the State to devote their energies to the discovery, not only of the more mature conditions of the species, already imperfectly known to us, but to the detection of other forms of these most interesting insects.

Psyche fragmentella, n. sp. Hy. Edw.

Chrysalis case about an inch in length, tapering gradually to its posterior extremity, and composed externally of portions of leaves and bark, mostly ovate in shape, and from one to two lines in greatest diameter, in most cases laid flat on the silken web, and not overlapping each other. Chrysalis, pale, tawny, shining, smooth, of uniform thickness throughout.

Length, 0.40 inch.

On trunks of pine trees, Strawberry Valley, Siskiyou County. Hy. Edw.

Psyche coniferella, n. sp. Hy. Edw.

Chrysalis case a little over an inch in length, thickened anteriorly and composed of fragments of the leaves of pine, about three lines in length, laid in rows upon the silken web, and overlapping each other, in the manner of *P. graminella* and other European species. The fragments diminish in length on the posterior layers.

Grass Valley, Cal. On palings and trunks of pine trees. Hy. Edw.

Æceticus Davidsonii, n. sp. Hy. Edw. (See engraving.)

Chrysalis case about one and a half to one and three-fourths inches in length; stout, a little thickened in the middle, and composed of pieces of sticks or twigs from one-third to one and a quarter inches in length, laid side by side longitudinally, one or two pieces nearly always extending posteriorly some distance beyond the termination of the case. The fragments with which the case is covered are of different lengths, and are about fifteen in number, the interstices being filled with wood dust (most probably produced by the jaws of the insect itself), closely woven into the silken groundwork of

the case. The edges of the pieces of wood are always neatly rounded by the insect, and all outstanding branches are bitten off. Chrysalis, with the abdominal portions, light chestnut brown, with the wing cases almost black. It is nearly tubular in form, smooth, with some small hooks on the abdominal segments.

Length, 0.65 inch.

Discovered by Prof. Geo. Davidson on Mt. Diablo, on the branches of *Castaneopsis chrysophylla*, Dougl., (chinquapin chestnut). I have much pleasure in recording this interesting discovery by attaching to the species the name of our respected President.

It will be observed, both in the present species and one closely allied to it from Australia, that there are, as I have shown, in most of the cases, some pieces of twigs longer posteriorly than those of which the remainder of the case is composed. It has struck me that these may be intended as a means to assist the male insect, on arriving at the perfect state, to escape from the body of the tube, the twig affording foothold and enabling the creature to draw its somewhat unusually long abdomen from the aperture. I do not state this as a fact, but the subject is worth the observation of those who may be fortunate enough to have the opportunity. I suspect that the cases containing males only have these lengthened sticks, but if this be so we are utterly at a loss to understand the process by which the creature arrives during the caterpillar stage at a knowledge of its sex, and so frames its habitation accordingly.



Cases of *CECETICUS DAVIDSONII*, attached to the stem.
1, 2, Chrysalis removed from its case.

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[From the Proceedings of the California Academy of Sciences, December 1, 1876.]

Pacific Coast Lepidoptera, No. 21.—Descriptions of two new species of the Genus *Thecla*.

BY HENRY EDWARDS.

Thecla Putnami. n. sp. Hy. Edw.

♀. Upper side. Pale fawn color, shading into dark drab or stone color at the base and costal margin. Fringes entirely white. Secondaries with a series of four indistinct lunulate spots, black, edged beneath with white; anal spot faintly tinged with golden yellow. Tails black, edged with white, and the apices also broadly white. Thorax and abdomen slate color. Antennæ dull slate, annulated with white.

Under side. Entirely grayish white. Primaries with black discal lunule and six submedian ovate black spots, each with a white ring. Near the posterior angle are four very faint black streaks, the under side of the primaries of this species bearing a close resemblance to that of many *Lycænas*, particularly that of *Ly. Pheres*. Bdv. Secondaries with black discal lunule and seven submedian spots as in the primaries, except that the one nearest to the abdominal margin is lunulate. The marginal markings peculiar to the genus are very faintly produced; the anal spot is a blackish, cloud-edged above with orange; the second and third are blackish, with a few blue scales intermingled, visible only with a lens; the fourth black, surmounted by pale orange, and the remainder black lunules, becoming faint as they pass the median nerve.

Exp. of wings, 1.25 inch.

1 ♀ (Coll. Hy. Edw.) Mt. Nebo, Utah, July, 1875. Taken by my friend, Mr. J. D. Putnam, of Davenport, Iowa, to whom I have great pleasure in dedicating the species. I should have hesitated to describe this insect from a single specimen, but its very decided character leaves me no room to doubt that it is a new species. In this opinion I am confirmed by Mr. S. H. Scudder, to whom I submitted this and the following species, and who has included both in his "Synonymic List of American Rurales, 1876." A second specimen of *T. Putnami*, which in its general character most resembles *T. Dryope*, Edw., was taken in Colorado, in July of the present year, by Baron von Osten Sacken.

Thecla Adenostomatis. n. sp. Hy. Edw.

♂. Dull slate brown on the entire upper surface, with a slight golden reflection when viewed obliquely. Fringes concolorous. Antennæ black, with white annulations; club, with its extreme tip orange above, entirely orange beneath. Eyes surrounded at their base by white hairs. Thorax and abdomen concolorous. Secondaries with anal angle slightly produced posteriorly, with a black streak at the base of the fringe, and above a very few blue scales. Tails short, black, with extreme tip white.

Under side of primaries slate drab, with very faint greenish tinge. Discal spot obsolete; a waved submedian unbroken line, white, edged anteriorly with dark slate; and six very faint submarginal patches of black. Secondaries, dark slate color at the base, from which along the abdominal margin are numerous white scales, giving a mottled appearance. Submedian band white, edged above with black, especially about the middle. Anal spot mottled with black and white; other markings a series of five or six lunules, black, edged above with whitish. All of these spots, when viewed with a lens, have a very faint trace of fulvous.

Exp. of wings, 1.15 inch.

♀. Similar to the ♂, except that the fringes are more decidedly white, the anal mark with a bluer tinge above, and the tail slightly longer than in the other sex. The club of the antennæ is also wholly black, except the extreme tip, which is orange.

Exp. of wings, 1.25 inch.

25 4 ♂. Tehachepi Pass, Southern California. Taken by Mr. R. H. Stretch, July, 1875. Closely allied to *T. Tetra*, Behr, but differing from that species by the apparently utter absence of fulvous, which is only distinguishable by a powerful lens. It is also slightly a larger insect than *T. Tetra*, and the wings are all more angularly produced than in that species. It is, however, sufficiently near to be confounded with it, and probably may be found in other localities in California.

[From the Proceedings of the California Academy of Sciences, December 18, 1876.]

**Pacific Coast Lepidoptera, No. 22.—Notes on some Diurnal
Lepidoptera, with descriptions of new varieties.**

BY HENRY EDWARDS.

Mr. W. H. Edwards, of Coalburgh, West Virginia, has in view the speedy publication of a complete check list of North American butterflies, and it has been suggested by him that all facts connected with the group known to observers in different parts of the region comprised by the work, should at once be published, so as to bring together such information as may, if deemed worthy, be incorporated in the more important publication. With this view I have made the following notes on some doubtful or little-known species, at the same time calling attention to such strongly marked varieties of some of our butterflies as seem to me worthy of special note. In these days of doubt as to the "origin of species," every trifling fact which can shed light on so important a field of inquiry becomes of striking value, and it appears to me necessary for all varieties which are apparently permanent to bear a distinguishing name, so that they may at once be recognized and hold their proper place in our nomenclature. The following remarks will be, therefore, taken at their true value, as I by no means claim that all of the forms described in this paper should rank as distinct species, though future observations may possibly elevate some of them to that position.

Parnassius Clodius. Menetries.

This species, like all of its genus, is liable to great variations, and there is little doubt that some of its extreme forms have been described under other names. Indeed, I am conscious of having unwittingly led Mr. W. H. Edwards into the error of believing that our forms represented *Clodius*, Menetr., and *Clarius*, Evers., and on my authority he has figured them as such in his "Butterflies of North America." Subsequent observations, however, led me to the conclusion that we had but one species, and the capture of some sixty or seventy specimens in Bear Valley in 1873, gave me a long series of intergrades, in which both of the forms above alluded to were certainly included, and with the knowledge that *Smintheus* and *Behrii* were but variations of one species, I could do no other than acknowledge the incorrectness of my former opinion. Dr. Boisduval appears also to have once been led into the same error, and afterward to have rectified it, as he leaves *Clarius* out of the list of species in his "Lepid. Calif., 1869." The clearness of the white ground, the size of the colored spots, and the presence or absence of the red basal patches of the under side, do not appear to constitute permanent characters, though at first sight they would seem to indicate distinct specific relations, while the size of the insect and the intensity of the colored patches seem to be modifica-

tions resulting probably from various altitudes, those of the less elevated regions being usually most pronounced in color. It should be remembered that *Clarius* was described by Eversman from specimens taken in the Altai Mountains, Siberia, and, on the high authority of Mr. H. W. Bates, our "Californian specimens do not resemble at all *Clarius* of the Altai," so that we have to blame Boisduval for introducing that species into our lists, instead of alluding to our extreme variations (as has been done in the case of *Behrii*) by a new name. That they are worthy of such distinction there can be no doubt, and I propose for perhaps the widest range of variety the following name, the specimens from which the description is taken being in my own collection. It must be borne in mind that this variety wanders considerably farther from the type than that figured by Mr. Edwards as *P. Clarius*, Evers.:

Parnassius Menetriesii. Hy. Edw. n. var. of *Clodius*. Menetr.

Imago ♂. Smaller than the typical forms of *Clodius*. Ground color of wings, sordid white; semi-transparent margin rather narrow, with the white lunules indistinct; the whole of the black marks of primaries are fainter than in *Clodius*, and there is no black spot in the submedian interspace. The secondaries have the abdominal margin comparatively more deeply edged with black, the line being distinctly bent inwardly toward the extremity of the cell; the colored spots are very small, almost obsolete, becoming simply pale pinkish or yellowish dots, surrounded by a narrow black ring. Under side vitreous, with a yellower tinge than above; all the marks fainter, except the colored spots of the secondaries, which are here, though small, distinct in color, and have white pupils. There is also a faint indication of a black bar on the anal angle, but no trace whatever of crimson basal patches. Head, thorax and abdomen beneath densely clothed with deep yellow hair, much darker and a more brilliant tint than in the typical form.

Exp. of wings, 2.25 inch.

♀. In nearly all respects this sex of the present variety resembles the ♂ of the type, and would at first sight be certainly so regarded. The transparent space of primaries is much smaller than usual; the bands are narrower and less defined, so that the white area of the wing is nearly as large as that of the male insects. The black patch in the submedian interspace is rather large, and the veins more sharply marked throughout. The secondaries have the colored spots small, but distinct in color, mostly pale crimson or orange, and surrounded by a black ring. The abdominal margin is only faintly black, and there is a trace of a black bar at the anal angle, which is, however, entirely without red. Under side similar to the upper in the black markings; the colored spots of secondaries are bright in color, and in some specimens there are two basal red patches, the anal bar more distinct than above, but without red. There is a seam of yellow hair along the abdominal margin, surmounted by yellow scales, a character which I do not find in my typical specimens of *Clodius*, and the yellow hair of the thorax and abdomen are almost golden in their tint.

Exp. of wings, 2.50 inch.

Bear Valley, Sierra Nevada (Hy. Edw.), Lake Tahoe (Hy. Edw.), Downieville, Cal. (Dr. Behr), Mt. Nebo, Utah (I. D. Putnam).

Parnassius Smintheus. Dby. Var. *Behrii*. Edw.

I have two specimens of this insect in my collection, one taken by Mr. J. Hutchings, of Yosemite, on the top of Mt. Dana, Cal., at an elevation of 10,000 feet, and the other by Mr. I. D. Putnam, in Summit Cañon, Utah. It is somewhat singular that the typical form of *Smintheus* never occurs in California, while the variety should be found here. Both of my specimens have the spots orange, and the double row of marginal lunules on the secondaries so characteristic of this strongly marked form.

Pieris venosa. Scud.

Perhaps there is no group so puzzling to an entomologist as that of the genus *Pieris*, to which this species and its allies belong, and the number of names which we find in our catalogues are the natural outgrowth of the widely different variations which we find in collections. Our Pacific Coast species rather tend to increase the confusion than otherwise, and in the separate opinions which exist as to their specific rank the complication becomes more and more intricate and unsatisfactory. In Lepid. *Heteroc. et Rhopt.*, No. 8, Mr. H. Strecker has advanced the idea that *P. venosa* and *P. castoria*, Reakt., are one and the same thing, and that they are simply the American forms of the European *P. Napi*, and I can, after an examination of many scores of specimens, but simply endorse his views. That *venosa* and *pallida*, Scud., = *castoria*, Reakt., are at times represented by widely differing varieties no one can deny, and if we take the extreme forms we should naturally regard them as distinct species; but intergrades may always be found, and among these intergrades we find what Scudder designated as *pallida*, which more nearly approaches Reakirt's type of *castoria* than it does that of Scudder's *venosa*. But the insects are not, as has been suggested, spring and summer generations, as they are both found together, appearing in early spring (sometimes in February), and continue on the wing until the end of April or the beginning of May, when they begin to die out. But admitting *P. venosa* and *P. pallida* to be forms of the same species, what becomes of *P. oleracea*? Among my specimens captured during the present year, as well as others taken in Colorado, Oregon, Vancouver Island, and Northern California, are some which continue the series of intergrades until they are merged into the exact counterparts of the Atlantic species of *P. oleracea*, and cannot be in any way distinguished from the well known species of the Eastern States. Is *P. oleracea*, then, but another form of a trimorphic or polymorphic species? Then, again, many of the individuals of *P. pallida* approach very closely (so closely as to suggest the very nearest relation), others of *P. Rapce*, and the form described by Mr. Scudder as *P. marginalis*, and afterwards by Mr. Reakirt as *P. Yreka*, can sometimes scarcely be distinguished from the varieties of *pallida*, upon which Reakirt founded his *castoria*. Do not, then, our American examples serve very powerfully to prove the common origin of all these forms, and show that we have hitherto attached too much value to what is designated a species, believing certain characters to be permanent, when, in fact, they are so only under the light of our limited knowledge? To illustrate more clearly my meaning, let us take a strongly marked and darkly colored speci-

men of *P. venosa* as our starting point, and we shall pass through the various stages thus, our insects becoming paler, and with the markings less pronounced, as we proceed.

1. *P. venosa*. Scud. Veins of underside of secondaries, broadly bordered with black scales; the lines of equal width to the margin of the wings.
2. " " Veins narrowing at the margin, with the ground color of the wings more yellow.
3. *Hulda*. Edw. Veins with their accompanying black scales, sometimes becoming confused, and spread over the whole surface; the lines of scales being sometimes quite indistinct, at others well marked and approaching the following: Surface of secondaries, yellow, with the nerves bordered by black scales, the lines being narrower as they near the margin.
4. *Napi*. L.
(Germany.) Like *Napi*, but with the whole of the lines a little narrower and fainter.
5. *frigida*. Scud. Lines all very faint, almost obsolete as they approach the margin.
6. *Napi*.
(Colorado.) Lines still fainter, quite obsolete at the margin, with the ground color of the wings still yellow.
7. *Napi*.
(Massachusetts.) Ground color usually white, sometimes pale yellow, with the lines bordering the nervures, very faint or quite obsolete, passing by many gradations into the following:
8. *pallida*. Scud.
=*castoria*. Reak. Veins without margins of scales, surface white or pale yellow.
- P. oleracea*. Veins without margins of scales, surface white or pale yellow.

We may pursue this still farther, until we arrive at a form of *oleracea* almost pure white, in which even the nervures themselves are scarcely to be traced by any definite color. But the subject may perhaps be better illustrated by retracing our steps, this time starting with *oleracea*, and endeavoring to show its relationship to *P. Rapæ*.

1. *P. oleracea*. Almost pure white, with faint yellowish tinge beneath. ♂ without spots.
2. " White, with very faint indications of spots on the primaries.
(Oreg. and N. Cal.)
3. *Castoria*. Reak. White, with faint yellowish tinge. ♂ with faint spots on the primaries.
4. *Marginalis*. Scud. White above, yellow beneath on secondaries. ♂ with distinct spots on primaries, and with the apex slightly dusky.
5. *Ergani*. ♂ with the apex more broadly dusky, and with the spots on primaries well defined.
(Europe.)
6. *Rapæ*. L. Apices broadly dusky. Spots very distinct and well defined. Underside of secondaries, white, greenish white to yellow.
7. *Novanglia*. Scud. Upper and lower surfaces yellow, spots and apices as in *Rapæ*.

Thus it will be seen, that according to my views, two branches of variation have proceeded from the one original source, though what that original source may be we are at a loss to tell, and that the most special characters distinguishing these two branches belong to *P. Pallida*, which in many respects resembles *P. Rapæ* as much as it does *P. Napi*. I am aware that there are other points of difference between the extremes of these insects, but certainly none more remarkable than between the darkly veined specimen of *P. venosa*, and the almost immaculate and veinless examples of *P. Pallida*.

Breeding the caterpillars through successive generations, will alone lead us to the truth, and unhappily at present we know but little of the earlier stages of these creatures. The present remarks must therefore be taken as a suggestion rather than the dogmatic statement of a fact.

Pieris calyce. W. H. Edw.

I am inclined, from the examination of a specimen in Dr. Behr's collection, to believe that this is the Spring generation of *P. occidentalis*. Dr. Behr's specimen was taken by Mr. R. H. Stretch, in April, in Carson Valley, Nev., and mine, from which the original description was made, and which is now in the possession of Mr. W. H. Edwards, was caught by myself near Reno, Nev. in the end of March. *P. occidentalis* occurs in the same localities in May, June and July.

P. Beckeri. W. H. Edw.

This species is said by Mr. Strecker and others to be identical with the Russian *P. Chlorodice*, Hb., differing only by its larger size. In support of this opinion, I may state that in my collection are two specimens (♂) from the Coast Range in Mendocino County, measuring only 1.50 inch in expanse, while those from Virginia City are over 2.00 inches; the smaller examples in no other respect differing from the Nevada specimens.

Nathalis Iole. Bois.

This pretty little species, as well as the var. *N. Irene*, Fitch, must be included in the list of Pacific Coast Butterflies, having been taken in some abundance near San Diego by the late G. R. Crotch, G. W. Dunn and others. It is extremely abundant near Cape St. Lucas, and in various portions of the country on the eastern side of the Gulf of California.

Anthocaris Creusa. Dby.

I have little doubt, from an examination of a figure by Mr. Butler of the British Museum, kindly loaned to me by Mr. W. H. Edwards, that this species is the same as *A. Hyantis*, Edw., which is well known to occur in the Sierra Nevada, and in other high lands in this State. It is said by Dr. Behr to be far from rare in the neighborhood of Oroville, and has been taken recently by Baron d'Osten Sacken in the Yosemite Valley, and by myself near Lake Tahoe. It is probably often confounded with *A. Ausoniedes*, but is abundantly distinct.

Anthocaris olympia. Edw.

This exquisite species exists in my collection from Colorado, near the Utah border, where it was taken by Mr. Winslow Howard.

Anthocaris Reakirtii. Edw.

I think I am wholly to blame if this should turn out, as I now suspect it to be, only a form of *Sara*, Bdv., as it was entirely through my statements that Mr. W. H. Edwards erected it to the rank of a species. The main points of difference are the smaller size, the irrorations of the costa, the straight line enclosing the orange apical spot, and the white females. But I find of late years, that these characters are by no means permanent, and that all gradations may be found. It is most probable, therefore, that *Reakirtii* is the spring generation, and *Sara* that of the summer. The former appears very early in March, and the latter in May and June. The ♀♀ of *Reakirtii* are at times, though only rarely, as yellow as those of *Sara*, and the irrorations upon the costa are as frequent in the latter as in the former.

Anthocaris lanceolata. Bdv. = *A. Edwardsii.* Behr.

In most of the males I have seen, the apices are only very slightly clouded with dusky scales but in two specimens taken in Kern County by Mr. R. H. Stretch, they are broadly and distinctly clouded, thus more closely resembling the other sex.

Callidryas eubule. L.

Examples of this species, of both sexes, were taken in San Diego, in August, 1875, by Mrs. James Behrens, flying about the streets of the city, and settling upon the flowers of the gardens. I have since received other specimens from Mr. G. Hitchcock, of San Diego.

Colias eurydice. Bdv.

Between the spring and autumn generations of this beautiful insect a great variation occurs, which is quite constant in all the examples which have come under my notice. In the spring specimens, which may be regarded as the type, and which make their appearance in April and May, the secondaries of the ♂ are wholly bright orange, without any spots or marks upon the margin, except some brown dots to note the termination of the nervures, while the ♀ is, with the exception of the large discal spot of the primaries, and a very faint brown marginal line, quite immaculate. The autumn brood, however, appearing in July and August, have the secondaries of the ♂♂ with a black marginal border, sometimes one and one-half or two lines in width, and the ♀♀ have the margins distinctly marked with brownish patches, and occasionally (though rarely) with a black submedian band, composed of clouded patches, interrupted by the nervules, reaching from the costa to the interior margin. If deemed worthy of a name, I should propose for this strongly marked form that of

C. eurydice. Var. *Amorphæ*. Hy Edw.

I have recently received from Mr. O. Barron, of Mendocino County, a magnificent variety of this species, in which the whole of the yellow space of the primaries (which usually bears the name of the "dog's head") is suffused with the richest purple, the orange being only slightly visible beneath it, thus giving the insect a most striking appearance.

Terias Nicippe. Cram.

Taken in Kern County, by Mr. R. H. Stretch, and by Mr. Dunn and others, near San Diego.

Terias Mexicana.

Taken in the neighborhood of San Diego by Miss Marcia Crane, and near San Bernardino by the late G. R. Crotch.

Euptoieta Hegesia. Cram.

This species is very common in Lower California, and occasionally wanders over the border into this State. I have received specimens taken undoubtedly within our limits, but it must at present be regarded as a rarity.

Agraulis Vanilla. L.

Very abundant in the gardens of San Diego in August and September. (Mrs. Jas. Behrens.)

Argynnis Liliana, n. sp. Hy. Edw.

I am unwilling to add another to the already long list of *Argynnis*, but can see no other way out of the difficulty which is presented to me by some specimens taken by me in Napa County. I have, however, much pleasure in dedicating what I believe to be a true species, to my friend, Mrs. Lillie Coit, who has added many great rarities to my collection, and at whose country residence, in one of the most charming portions of the State, the species seems to have made its home. It is intermediate between *A. Calippe*, Bdv., and *A. coronis*, Behr., partaking of the characters of both, yet I think distinct in the following details:

It is darker in color of the upper side than *A. coronis*, and very much darker than *A. calippe*, being of a rich reddish brown. The markings above similar to those of these two species. Beneath, the primaries are largely suffused with reddish brown, as in *coronis*, but the remainder of the wing is occupied by bright buff, not dull ochreous as in *coronis*. The silver spots of the margin are very decidedly triangular, and not ovate as are the apical ones of *coronis*. On the lower wings the differences are more apparent. The silver spots are larger proportionally than in any other species with which I am acquainted, while the sheen of the silver is exceedingly vivid and intense. The marginal spots are quite triangular, and the large one of the cell more decidedly oblong than either in *A. coronis* or *A. calippe*. The ground color of the wing is bright buff, inclining to orange; much the same color as in *A.*

rupestris, and by no means brown as in *A. coronis* and *A. calippe*, thus giving a brighter and more lively appearance to the whole of the underside.

Without forming a *positive* conclusion as to its value as a species, I think this form well worthy of a separate name. I have taken it for three seasons past near St. Helena, Napa Co., and altogether have had before me thirty-four ♂ and seven ♀, all of which are true to their own type, presenting among themselves little or no variation. When placed side by side with long series of the closely allied species, this insect presents at once so great a difference as to strike the observer, being quite as complete as that between *A. coronis* and *A. nevadensis*. The actual position of many of our *Argynnis* as species, can only be determined, however, by watching the insects through their various stages.

Argynnis monticola. Behr. Var. *purpurascens*. Hy. Edw.

Under this name I wish to recognize the form of *Arg. monticola*, which is found chiefly in Siskiyou County, in the region surrounding Mt. Shasta, as well as in some parts of Oregon. It differs from the type, by the larger amount of black on the upper surface, visible in both sexes, by the smaller size, and by the more suffused appearance of the lower side. The spots are somewhat larger proportionally than in the type, in this respect resembling *Zerene*. Behr, and the basal half of the secondaries is much darker in color, while the margins of all the spots are larger and more intense. The whole of the underside is also tinted with a purplish efflorescence, very visible in fresh specimens. The female is always deeply suffused with black on the lower side, and almost invariably has the spots either partially or wholly silvered, a character not observable in the typical *monticola*. This beautiful variety was first taken by Mr. W. G. W. Harford, at the Dalles, Oregon, and subsequently by Mr. J. Behrens at Soda Springs, Siskiyou County, in which last named locality I took about forty specimens, all characterized as mentioned above, in the fall of 1875. It closely connects *A. monticola* with *A. Zerene*, and may have been under Dr. Boisduval's eye when he confounded these two species.

Argynnis myrina.

Though not found in California or Oregon, this species was taken in abundance near Sitka, Alaska, by the late Mr. Bischoff. The specimens are smaller than those of the Eastern States, and the whole of the underside brighter in color, with the silver spots proportionally of a larger size.

Melitæa Leanira. Bdv. Var. *Obsoleta*. Hy. Edw.

Near San Rafael, in Marin County, I annually take specimens of a very curious variety of *M. Leanira*, so constant in its characters as to suggest the idea of a new species. In the lower side of the typical form, the secondaries are marked with black blotches near the base, and a double submedian band inclosing a series of seven spots of the pale ochraceous color of the ground. In the variety *obsoleta* these marks are all obliterated, and nothing appears

but the black nervures and a slight black marginal line. In all other respects the insect agrees with the typical form. It is somewhat singular that in the locality in which these varieties are found I never met with the true *Leanira*, which is always a very local insect, and that, although I know several localities in which *Leanira* is found, it is only in the one mentioned above that I ever met with the var. *obsoleta*.

Pyrameis. Hybrid between *P. Carya* and *P. Atalanta*.

Hybrids among diurnal Lepidoptera are very rare, and the present is a very interesting form, worthy of record. It was raised by Dr. H. Behr from a caterpillar found feeding on nettles (*urtica*) at Lagunitas, Marin County, in July, 1876. The perfect insect appeared in August. It presents a very singular conjunction of the characters of the two species, of which it is undoubtedly a hybrid. The spots across the primaries form a bent macular band, the sub-apical spot being red and not white as in *Atalanta*, the base of the wing behind the band being rusty red. The secondaries are blackish nearly over the whole surface, with reddish hairs, which are longest toward the base; the submarginal row of ocelli similar to those of *carya*, only with white pupils. The under side is that of *Atalanta*, the abdomen being neither black nor red, but brownish, the color of the anal margin of the hind wings. Altogether it is a very remarkable production of the two species, and should be figured, so that such an interesting hybrid may not be lost.

Limenitis Lorquini. Bdv.

In all the specimens I have received from Vancouver Island, the ground color of the under side has a purple tint in place of the snuff-brown of the usual form, and in two specimens received from near Virginia City, Nevada, taken by Mr. W. Eaves, I note more remarkable changes. On the upper side the white macular band is very narrow, and is edged on the secondaries posteriorly by a very distinct row of ovate orange spots, reaching quite to the costa, while inside the ochreous apical patch of the primaries, and beneath the outer band of three white spots, which is peculiar to the species, there is a duplex spot also of orange. Beneath, the wings have considerably more white than the type, and the basal spots of the secondaries are clear white and oblong in shape. I desire to record this well-marked variety by the name of *Limenitis Lorquini*. Var. *Eavesii*. Hy. Edw.

Coenonympha Eryngii. n. var. Hy. Edw.

Under this name I wish to recognize a remarkable form of *C. californica*, taken by me in considerable numbers at Soda Springs, Siskiyou County, in the fall of 1875. The upper side is exactly that of *C. californica*, var. *galactina*, wanting the black or dusky hairs at the base of the wings, the thorax and abdomen being concolorous. The under side is characterised by the usual straight band on the primaries and the waved or dentate line of the secondaries, but there is an utter absence of points, spots or ocelli, in this respect closely approaching the ornamentation of *C. inornata*. I took this insect only

in one locality, flying about the beautiful *Eryngium petiolatum*, Hook, which here attains a large size, and a most brilliant bluish color.

Size of *C. californica*. Soda Springs, Siskiyou County, Cal. Hy. Edw., August. (11 ♂; 9 ♀; Coll. Hy. Edw.)

Thecla scæpium. n. var. *fulvescens*. Hy. Edw.

A very strongly marked variety of *T. scæpium* occurs rarely throughout the State. It is usually smaller than the type, and very much paler in color, being occasionally of a golden brown instead of chestnut tint. The fringes are whiter than in *T. scæpium*, the under side much fainter in color, with the markings less pronounced, and the submarginal band always more distinctly edged with white. It may prove ultimately to be a new species, but for the present I prefer to regard it as a variety of the common form alluded to.

Lake Tahoe, Hy. Edw. Tehachepi Pass, R. H. Stretch. Havilah, Kern County, R. H. Stretch. (2 ♂; 2 ♀; Coll. Hy. Edw.)

Thecla melinus. Var. *pudica*. n. var. Hy. Edw.

I have before me two specimens (♂ ♀) of an insect which at first sight appeared to me a new species, but which I now think can only be considered a variety of *T. melinus*, Bdv. It is considerably smaller than *melinus*, being only 0.90 inch in expanse, while *melinus* measures 1.25 to 1.30 inch. The upper side is similar to that of *melinus*, but the lower side is more silvery gray, with the markings in the primaries utterly obliterated, and a distinct black line at the base of the fringe. The markings of the secondaries are similar in outline to those of *melinus*, but they are extremely faint, and the anal orange spot is almost obsolete, while the red bordering to the submarginal band, so conspicuous in *melinus*, is here reduced to a few scattered scales.

Contra Costa County. Hy. Edwards. June, 1875.

Perhaps a long series of specimens will show the identity of *T. melinus*, Bdv., and *T. humuli*, Harr., but in all the examples I have seen of the latter, I miss the red scales bordering the submarginal band above alluded to. But beyond this, I see no character by which they can be separated.

Lycæna speciosa, n. sp. Hy. Edw.

Pale silvery blue, the color of *L. mellisa*, Edw. Fringes, very broad, clear white, cut very distinctly by black at the ends of the nervules. Underside, pale silvery gray, with a very minute round black spot on the costa, and a series of five round sub-marginal and one oblong central spots arranged almost in circular form on the disc. There is also a distinct oblong discal spot, and a smaller round one on the internal margin. The whole of the spots on the primaries are comparatively large, very distinct, and jet black, without white margins. The secondaries have one basal dot, a minute discal point, and a sub-marginal row of seven small black spots, also without white margins. Fringes, as in the upper side. Anterior, with the club unusually large, and

the shafts distinctly annulated with white. Thorax and abdomen, blackish above, silvery beneath.

Exp. of wings, 0.70 inches.

Havilah, Kern County, R. H. Stretch. (1 ♂ Coll., Hy. Edw.)

I should have hesitated to describe this exquisite species from a single specimen, but the peculiar arrangement of the spots on the lower side of the primaries, its extremely small size, and the broad and distinctly black and white fringes serve abundantly to distinguish it from any other form with which I am acquainted.

N. B. As I intend to devote a separate article to the species of *Colias* proper, I have omitted all reference to that genus in the present paper.

[From the P.]

Pacific Coast

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[From the Proceedings of the California Academy of Sciences, January 15, 1877.]

Pacific Coast Lepidoptera.—No. 23. Description of a New Species of *Catocala*, and a List of the Californian Specimens of the Genus known to occur in collections.

BY HENRY EDWARDS.

Catocala Jessica, n. sp. Hy. Edw.

Expands, 2.30 inch ♂; 3.00 inch ♀.

Primaries, dull gray, mottled with brown, with the lines all distinct, and recalling more than any other Californian species, the coloring and ornamentation of *C. Nupta*, of Europe. Basal line, distinct, regularly serrate on its outer edge. T. a., less strongly marked, with a whitish space near the middle. T. p., with two large teeth above the median vein; thence oblique to internal margin, where it is united to the t. a. Along the posterior edges of both these lines are distinct shades of brown. Sub-terminal, whitish, edged exteriorly with black, bent on the costa anteriorly, but afterwards parallel to the margin to the internal angle. Black intronerval spots, very distinct, and somewhat lunate. Fringe, gray. Reniform, surrounded by a blackish cloud; sub-reniform, fawn-color, with brown cloud.

Secondaries, yellowish red, intermediate in shade between *C. parta* and *C. amatrix*. Abdominal margins, pale fawn-color. Median band, narrow, almost straight, scarcely constricted in the middle, and terminating abruptly about three lines from the inner margin. Marginal band, moderate, a little widest in the ♀, even along its inner edges, with two large and well defined dentations near the anal angle. Apex, white, reddish yellow at the base. Fringe, long, clear white, yellowish red at base through nearly its whole extent. Thorax, iron gray. Abdomen, fawn-color.

Underside with the usual white bands, all clear and well defined, but with a very strongly marked and unusual red tinge on the primaries, particularly on the abbreviated medium band. The red shade of secondaries occupies more than two-thirds of the wings. Fringe of primaries yellowish gray, of secondaries clear white. The medium band of secondaries much narrower than in the upper side. Thorax and abdomen fawn color. 1 ♀, 1 ♂, Havilah, Kern Co., Mr. R. H. Stretch. (Coll. Hy. Edw., No. 6,648.)

Closely allied to *C. Californica*, W. H. Edw., but differing by the browner tint of primaries, the more yellow shade of the secondaries, the narrower median band, and particularly by the large amount of reddish tint on the lower surface. It may, however, prove to be an extreme variety of that species.

I am so frequently asked for specimens of our Pacific Coast *Catocalæ*, and particularly by entomologists at a distance, that I am induced to give the fol-

lowing list of all the specimens known to me to exist in the various collections throughout the country, from which it will be seen how utterly impossible it is at present to hold out hopes to collectors of enriching their cabinets with our species:

LIST OF PACIFIC COAST CATOCALÆ.

	Hy. Edw...	Dr. Behr...	I. Behrens.	Strecker...	Ent. Soc. Philad.
<i>Californica</i> , W. H. Edw.....	*3	1	.....	.....	1
<i>Irene</i> , Behr.....	*2	1	1	.....	.....
<i>Mariana</i> , Hy. Edw.....	1	.....	.....	.....	.....
<i>Cleopatra</i> , Hy. Edw.....	2	.....	.....	1	.....
<i>Stretchii</i> , Behr.....	1	1	.....	.....	.....
<i>Faustina</i> , Strecker.....	.....	1	.....	1	.....
<i>Perdita</i> , Hy. Edw.....	3	.....	.....	1	.....
<i>Luciana</i> , Hy. Edw.....	*2	.....	.....	1	.....
<i>Hippolyta</i> , Hy. Edw.....	2	.....	.....	.....	.....
<i>Aholibah</i> , Strecker.....	3	.....	2	2	.....
<i>Marmorata</i> , W. H. Edw.....	.....	.....	.....	.....	1
<i>Augusta</i> , Hy. Edw.....	1	.....	1	1	.....
<i>Jessica</i> , Hy. Edw.....	2	.....	.....	.....	.....
<i>Zoe</i> , Behr.....	2	1	.....	1	.....

Those marked thus (*) are poor specimens.

[From the Proceedings of the California Academy of Sciences, February 5, 1877.]

**Pacific Coast Lepidoptera.—No. 24. Notes on the Genus
Colias, with descriptions of some apparently new
forms.**

BY HENRY EDWARDS.

It is generally admitted by entomologists that the accumulation of large series of specimens of any special group is necessary for the proper elucidation of the species composing that group; but in the genus under consideration, the contrary would almost seem to be the case, for the species of *Colias* are so complicated among themselves, so liable to variation, and probably so given to hybridism, that nearly every specimen taken, on the Pacific slope at least, serves only to increase the confusion, and by presenting some differences of detail from its nearest ally, adds to the difficulty which surrounds this very puzzling genus. *Argynnis* may be defined as regards its species; and though some of them may approach very closely to others, it is possible, in the majority of these insects, by assembling many specimens, to define where one form begins and another ends; and even *Melitaea* may by study and perseverance come to be fully understood, but *Colias* baffles all industry, and we rise from the contemplation of a large mass of specimens with our ideas as to their specific value very much confused, and in an unsatisfied condition as to the results of our labor. Through the kindness of Mr. S. H. Scudder and Mr. W. H. Edwards, I have had the opportunity of examining the types of nearly all the species described by those gentlemen, and to their generous aid I am indebted for much of the information I possess concerning the more doubtful forms. My own collection contains 171 specimens, including 24 N. American species or varieties, those not represented being *Christina* Edw., *Emilia* Edw., *Chippewa* Edw., and *Astræa* Edw. All, however, with the exception of *Chippewa* and *Christina* I have seen and examined. In addition to these, I possess 77 specimens representing 19 species, from Europe, Asia, etc, for comparison with our forms, so that I am provided with a fair amount of material, larger, indeed, than may be found in most collections on the continent. And yet I frankly confess my inability to see my way clearly through this intricate genus, and may probably be deemed guilty of the sin of making "confusion more confounded." In offering the descriptions of what appear to me to be new forms, I do not, however, distinctly claim for them the rank of species; but when a number of individuals true to each other and constant in their general details, are found to occur in any given section, it is best for all purposes that such should be distinguished by a separate name, leaving the discussion as to their specific value to be determined by the only true test known to us, viz.: breeding through several generations, and careful and continued observation upon the various stages of the insect's life. In course of time the many difficulties which perplex the student of this group will be

cleared away, and each form will then be forced into the position assigned to it by the great classifier, Nature herself. It should never be forgotten that in the European and Asiatic species, which have been carefully and frequently studied for nearly a century, all is not yet made clear; and that differences of opinion exist among the most learned entomologists as to the specific rank of more than one well known form. This is a fact which should at least teach us patience, and induce N. American entomologists to regard the labors of their brethren as actuated by good intentions, and scarcely worthy of the hard words which too frequently follow the varying conclusions which naturally arise upon a complicated subject in separate minds. Though the rash descriptions of apparently new forms is in general to be deprecated, it is to my mind, in a group like the one under our present consideration, of immense value that every variation should be noted, as the publications of such varieties at once calls attention to them, and brings the observation of naturalists upon the one given point, thus almost insuring in time a clear and scientific determination of the matter. In his description of *C. Eriphyle* (Trans. Am. Ent. Soc., Vol. 5, 1876), Mr. W. H. Edwards says: "I have not a doubt of the blood relationship of all these forms, and to speak no further, of every member of the genus; and I see no alternative between lumping them all together, or the holding breeding true to each type to be for all practical purposes a sufficient test of what is called a "good species." There is no sort of assurance that in this and many similar cases, one form is a variety of the other—that is, has sprung from the other. All have sprung from a common ancestor, from whose type they have one and all departed, and naturally have inherited many points in common, while they have come to differ in many others. * * * They have been varieties—they now are species; that is, permanent varieties; for no man can give a better definition of a species than that. But they are not varieties one of the other, for all that appears." This seems to me to cover the whole ground; and it is in the spirit of the opinions above quoted, that this paper is offered to the consideration of entomologists.

It appears to me that the N. American species structurally arrange themselves into two grand sections, viz.:

1. Those with a glandular space at the base of the secondaries of the males.
2. Those without this glandular space.

Of the first division we have but one species, *C. Meadii*, Edw., discovered a few years since by Mr. T. Mead, in the Rocky Mountains, Colorado, and exquisitely figured in "Edwards' Butterflies of N. America." To the second section, which must be subdivided into groups, belong, with the one exception referred to, all our N. American species. Perhaps a convenient tabulation of these will be as follows:

GROUP I.

Color of the wings, orange or very deep yellow. Females with the marginal band distinctly maculate.

- a. Marginal band very broad; color deep orange.—*Eurytheme*.
- b. Marginal band moderate; color pale orange.—*Kewcadin*.
- c. Marginal band very narrow; color citron yellow with orange disc.—*Ariadne*.

GROUP II.

Color of the wings orange in the ♂; lemon yellow in the ♀. Marginal band entirely wanting in the ♀.—*Christina*.

GROUP III.

Both sexes lemon or pale yellow, with the marginal band moderately broad through its entire length.

a. Marginal band distinct and decidedly maculate in the ♀.—*Philodice*, *Eriphyle*.

b. Marginal band distinct, but not maculate in the ♀.—*Laurentina*.

c. Marginal band of ♀ indistinct, mostly consisting of scattered scales.—*Occidentalis*, *Chrysomelas*, *Alexandra*, etc.

GROUP IV.

Males lemon yellow. Females usually white. Marginal band of ♀ broad only at the apex —*Pelidne*, *Palæno*.

GROUP V.

Both sexes greenish, more or less suffused with black.

a. Marginal band distinct and entire in both sexes; discal spots clear yellow.—*Behrii*.

b. Marginal band of both sexes maculate; discal spots indistinct, greenish white.—*Nastes*.

Imperfect as this table may be, it may be of some service in pointing out the special characters most common to the various groups, and so lead to an understanding of what are the permanent points of difference between them. The complication of species occurs chiefly in Group 3, those allied to *Philodice* on the one hand, and *Alexandra* on the other, offering the greatest puzzle to the investigator; and it is to this group that the forms described in the present paper must be referred. I shall, therefore, only briefly allude to those which may be considered as settled species, omitting all reference to *C. Cæsonix* and *C. Eurydice*, as, by many authors, these species are regarded as forming another genus, viz: *Zerene*, Hubn.; *Meganostoma*, Reakirt.

The N. American species are as follows:

SECTION I.

GROUP I.

C. Meadii, W. H. Edw.

This beautiful species appears to have its home solely in the Rocky Mountains, Colorado, where it was captured in considerable numbers by Mr. T. L. Mead in 1871. By some great error of judgment, it has been considered by the eminent European entomologist, Professor Zeller, of Stettin, to be only a form of the European *C. Myrmidone*, Esp., which wants the gland at the base of the secondaries, so strongly characteristic of *C. Meadii*. In a long series it is utterly impossible to confound the two species, the equal width of the band in *Meadii*, against the broad apical margins narrowing extremely to the internal angle of *Myrmidone*, being sufficient to mark this distinctness. *Myrmidone* is far more nearly allied to the African *C. Electra*, and to the European *C. Edusa*, than it is to the strongly marked and widely separated *C. Meadii* of

Colorado. The discal spots of the lower side are almost obsolete in *C. Meadii*, while in the other orange species alluded to, they are large and strongly marked. Surely if characters like these go for anything at all, *C. Meadii* may well lay claim to the position of a well marked species.

SECTION II.

GROUP I.

C. Hecla, Lef.

This species is only found in the Arctic regions, its chief habitat being the neighborhood of Disco, Greenland, where it has been observed in large numbers. I am not aware of its having been found in N. America proper. It is of a rich but rather pale orange, much paler than *C. Meadii*, and has the marginal border of the ♂ narrow throughout, widest at the apex. In general appearance, with the exception of its darker color, it is not unlike *C. Chrysotheme* of Europe.

C. Eurytheme, Bdv.

This, the most showy and the largest of our Pacific coast species, is an abundant insect in clover and alfalfa fields from July to September, the richest and most deeply colored specimens occurring latest in the year. It may prove that the following species is only the Spring generation of *C. Eurytheme*, though Mr. W. H. Edwards thinks differently, as he has caterpillars of both, differing considerably from each other. In general terms, the present species is characterized by the wide black marginal band of the male, densely powdered with yellow scales, and distinctly cut toward the apex by the yellow nervures. The black band is also continued for a considerable distance along the internal margin, whereas in *Keewaydin* it ends rather abruptly near the internal angle. The costa of the primaries is citron yellow, strongly contrasting with the rich deep orange of the disc. The margin of the secondaries is decidedly broadest in the middle, and sinuate on its inner edge, while the discal spot is very large, showing through upon the upper surface, as a deep orange blotch. In *Keewaydin* the general color is much paler throughout, though it must be confessed that the differences are rather those of degree than of kind. The discal spot of the secondaries is always rounder than that of *C. Eurytheme*, and the marginal border much narrower. The difference between these two may be more clearly seen in the ♀. The marginal border in *C. Eurytheme* has the yellow patches very much smaller in size than they are in *C. Keewaydin*, thus giving a blacker and heavier appearance to the insect; and this character is equally marked in the albino ♂ of both, and while the border of the secondaries in *C. Eurytheme* continues its broad and distinctive character, in *C. Keewaydin* it is very much narrowed, and in some specimens all but obsolete. In fact, *Eurytheme* and *Keewaydin* are much more readily separated by the females than by the males, many examples of the latter sex occurring to suggest the idea that they may be forms of one species, while the females are always characteristically distinct. *C. Eurytheme* is rare in the mountains, while *C. Keewaydin* is always abundant at even very considerable elevations. A male *Eurytheme* in my collection measures 2.60 in. in expanse of wing. This is

undoubtedly the species referred to by Boisduval as *C. Amphidusa*, and by Menetries as *C. Edusa*, var. *Californiana*.

C. Keewaydin. Edw.

The commonest butterfly of California and adjacent districts, appearing in April or early May and continuing throughout the Summer. I have taken it from San Diego, in Southern California, to Vancouver Island. Its principal characters are pointed out above. I take this form to be Boisduval's *C. Chrysotheme* var.

C. Ariadne. Edw.

A local and early species, of which there is a second brood. In the first warm days of February specimens of *Ariadne*, entirely fresh, have been taken by me on the hills near San Francisco, and in August some fine examples were brought from Yosemite by Mr. T. L. Mead. I have previously alluded to the tendency to hybridization displayed by the species of this genus, and may here relate my experience therein. In July, 1874, while staying at the Big Tree grove, Calaveras County, I took a ♀ and ♂ *Colias in coitu*. The ♀ was a small, pale, narrow bordered *Ariadne*, and the ♂ a rich deep orange, broad bordered *Eurytheme*. Some few days after, the exact opposite occurred to me. This time the ♂ was a rich orange *Eurytheme*, and the ♀ a small, pale yellow, faintly marked *Ariadne*. I carefully shut up the ♂ ♂ in separate boxes, putting clover plants with them, in the hope of securing the eggs. But I met with no success, and on my arrival in San Francisco I found both females dead, the extreme heat and the jolting of the stage over the rough mountain roads no doubt having much to do with this misfortune. I believe hybridism to be rare among diurnals, even in species so nearly allied to each other as are those of the genus under consideration, but here are two cases of extreme interest whose value is, however, much lessened by the want of opportunity for observing the result. It can hardly be that the large deep orange *Eurytheme* and the pale yellow and fragile looking *Ariadne* can be one and the same thing, linked together by *Keewaydin* and a series of intergrading forms; but it would be difficult to arrive at any other conclusion, unless, as I have stated, the above mentioned instances are regarded as cases of hybridization. In *Ariadne*, the marginal border of the male is very narrow, much widest at the apex, distinctly cut throughout by the nervures. On the secondaries it is very short, terminating a little beyond the median nervure, and never, as in *Keewaydin* and *Eurytheme*, extending to the anal angle. The color of the wings is pale citron yellow, with an orange cloud on the disc resting on internal margin, but never reaching the costa. The discal spot of primaries is oblong, sometimes almost linear, and is brown, surrounded by an orange shade. The females, in this instance, bear a great resemblance to those of *Keewaydin*, except that they are smaller in size, and much paler in color. *Ariadne* seems to bear the same relations to its allies that the European *Chrysotheme* does to *Edusa*. I have never seen albino females.

Marin County, Contra Costa County, San Mateo County (Hy. Edw. in February and March), Big Trees (July), Virginia City, Nevada (July), Yosemite Valley (Baron v. Osten Sacken, July), (T. L. Mead, August), Santa Barbara (G. R. Crotch, July).

GROUP II.

C. Christina. Edw.

I know nothing of this species beyond its description and figure in Edwards' "Butterflies of N. America." The pale yellow female wholly wanting the marginal border, is sufficient to distinguish it from any other described form. It is from the Great Slave Lake. I am not aware of its recapture since its discovery in 1862.

GROUP III.

a.

The present group, as I have said, contains by far the larger number of our N. American species, and it is here that our greatest difficulties appear. The best known and most abundant form is

C. Philodice. Godart.

This well known and widely distributed species is, like all of its relations, apt to run into varieties, one of which, *C. Anthyale*, Hubn., (hereafter noted) is extremely different from the type. In a series of examples from Canada (four ♂, three ♀) forwarded to me by Mr. W. Couper, I observe that the shade of yellow is a trifle paler, and the marginal border of the males decidedly narrower than in specimens from New York. Pennsylvania, etc., while the border of the female is very wide at the apex, with the maculations almost obsolete. The secondaries are somewhat angularly produced in the middle, and the discal spot is large and bright orange. I possess, also, a single specimen of a male from New York, in which the whole of the nervures are jet black, giving the insect an almost reticulated appearance. The under side has the internal margin heavily clouded with black, while the discal spot of secondaries is deep purplish brown. I can only, however, consider these forms as variations of *Philodice*. I may here remark, that in all the examples I have had the opportunity of examining, the marginal band in *Philodice* is entire, or not divided by the nervures, a character on which, in this difficult genus, I am induced to place considerable importance. Sometimes, but by no means always, the nervures cross the band at the apex, but even then only indistinctly, while in some of the species hereafter mentioned, the band is always divided, and this character becomes permanent and constant in every specimen. In one example from Bismarck, N. P. R. R., forwarded to me by Mr. W. H. Edwards, as a variety of *Philodice*, the band is more clearly cut by the nervures, and there are other points of difference, which, if constant, would entitle this insect to at least a separate name. The discal spot of both primaries and secondaries is very small, and the fringes are decidedly more pink than is usual with *Philodice*. The insect is smaller than the average *Philodice*, and the marginal band comparatively wider. I simply point out what appear to me to be permanent differences, but forbear to call this form by another name, leaving it to Mr. Edwards to do so, if he finds from his larger series that the characters are of any value.

C. Anthyale. Hubn.

As represented in Hubner's plate, this form has the border very much narrower than *Philodice*; and in a specimen received from Mr. W. H. Edwards,

taken in W. Virginia, it is, upon the secondaries, reduced to a mere line. The fringes are very wide, deep pink, and the discal spots very large and distinct. There is also a very large amount of pink upon the lower surface. Expanse of wings 1.50 inch; average expanse of *Philodice*, 1.85 inch. It is, however, now generally conceded that *C. Anthyale* is but a variety of *C. Philodice*.

C. Eriphyle. Edw.

An exquisite species, to my mind entirely distinct, and easily separated from *Philodice*, its nearest ally. The color is very much paler, being primrose instead of lemon yellow; the marginal band of the male is narrower comparatively, and always separated by the nervures, and the base of the costa is invariably tinted with deep orange in both sexes. The female has the macular band more densely covered with yellow scales, while the spots are larger in proportion, though less distinct than in *Philodice*. The fringes, antennæ, head and thorax are more decidedly pink, and the discal spot of secondaries is larger, bright orange, and thus more distinct by contrast with the color of the field. The average size is less than that of *Philodice*.

This beautiful species was taken in considerable numbers at Lahache, B. Columbia, by the late Mr. G. R. Crotch.

C. Astræa. Edw.

Though the female of this species is at present unknown, it will most probably find its place here. It is singularly distinct in color from any other known *Colias*, being a pale buff, rather than yellow proper. Two males from the Yellowstone region are in the collection of Mr. W. H. Edwards.

b.

C. Laurentina. Scud.

I am decidedly inclined to endorse the opinion expressed by Mr. W. H. Edwards in his recent article on *Philodice*, that the present form is entitled to rank as a species, as it evidently breeds true to its type. I am indebted to Mr. Scudder for an opportunity of examining this very interesting insect, the female of which has the apex *only* clouded with black, without any trace of the maculations observable in *Philodice* and *Eriphyle*. *C. Laurentina* was taken in Cape Breton Island, by Mr. Thaxter, where it appears to be abundant. In many respects this insect more properly belongs to Group IV; but as it has been considered by Mr. Scudder as a variety of *Philodice*, I retain it here, as the present tabulation is merely offered for convenience rather than as a scientific arrangement. Nearly allied to *Laurentina*, are two specimens in my collection, to which I venture to apply the following name:

C. Barbara. Hy. Edw. n. sp. ?

Whole upper surface bright canary yellow, with a black cloud at base of wings, densest on the primaries, and a few scattered black scales are visible along the costa. The marginal band of the primaries is composed of black atoms, through which the yellow of the ground color is distinctly seen. It is broadest at the apex, thence narrowing slightly, and continued of equal width to the internal angle. In this respect it differs greatly from *Laurentina*, in which the band is apical only, and obsolete before reaching the internal margin. The costal edge of primaries is pinkish, most distinct at the base;

the discal spot is small, ovate, deep yellow, surrounded by a black ring. The secondaries are totally destitute of any border. The discal spot is circular, pale orange, surmounted by a smaller spot of the same color. Head in front and above, dull yellow, with a pink fringe. Palpi yellow at their base, pink at the tips. Antennæ brownish pink; club, chestnut brown. Thorax black, with long, pale greenish yellow hairs. Abdomen black above, with yellow atoms on the sides.

Under side.—Primaries pale lemon yellow, powdered along the margin with black atoms, more broadly so at the apical and costal edges. Costa and fringes decidedly pink. Discal spot with the yellow centre very plainly marked. Secondaries more closely and thickly powdered with black atoms, giving a greenish appearance to the surface, and with a dark rose pink streak at the base. Discal spot large, circular, clear white, surmounted by a smaller one, each surrounded by a brownish ring. Under side of thorax and abdomen bright lemon yellow, the former with very long hairs. Tibiæ yellow; tarsi pink. Expanse wings, 2.00 inch. Male unknown.

Two females (Coll. Hy. Edw.), Santa Barbara, Baron v. Osten Sacken; Gilroy, J. Behrens.

c.

C. Chrysomelas. Hy. Edw. n. sp.

Size of *C. Eurytheme*. Male. Bright citron yellow, occasionally, but very rarely, with a slight orange tint. Marginal band very broad, black, powdered with yellow scales and cut by the nervures, but never to the extreme margin. At the apex the nervures are very broad and distinctly yellow. The discal spot is remarkably small, usually a mere dot, and not unfrequently entirely wanting. Costal margin pink, with a few black scales. At the base of the wings, a distinct black cloud, most strongly marked in the male. Secondaries with the marginal band very broad, as in primaries, *distinctly cut by the nervures*, with the discal spot only faintly shown on the upper surface.

Under side, primaries lemon yellow along the internal margin and on the disc; orange at the base, along the costa, and at the apex. The disc of the wing is closely powdered with black scales. Secondaries, orange, all except the margin densely covered with black scales. Discal spot, pink, surrounded with brown, which later color forms a smaller patch surmounting the discal spot. Near the apex is a brown dash, and one or two very faint submarginal points are visible beyond the middle of the wing. The fringes are decidedly and broadly rose pink, and there is a dash of the same color at the base of the secondaries. Antennæ bright rose pink, thorax black, with long yellow hairs. Abdomen blackish above, lemon yellow beneath. Expanse wings, 2.00 inch.

Female. Paler than the male, with the marginal band broad, but broken up into a series of yellow clouds, with no distinct form. Discal spot small and incomplete, as in the male. On the secondaries the band is almost obsolete and does not extend beyond the median nervure. The discal spot is pale orange. Fringes broad, rose pink. Lower side similar to the male, except that the discal spot of secondaries is usually pinkish white, surrounded by a purplish brown ring. Expanse wings, 2.25 inch.

Seven ♂, five ♀. Napa County, Cal. (Coll. Hy. Edw.). I have no doubt whatever of the distinctness of this species. It is most nearly allied to *C. Occidentalis* (Seud.), the original types of which species are now before me. It differs in the extreme width of the marginal band, equally broad on primaries and secondaries, and always distinctly cut by the nervures on both wings; by its much larger size, and by the paler ground color of the female, with more pronounced marginal border. The usual absence of the discal spot of primaries is also a strongly marked character. I have never seen an albino female of this species.

C. Occidentalis. Seud.

Mr. W. H. Edwards has obligingly lent me the types of this species, which gives the key to a good number of our Pacific Coast forms. I have taken specimens exactly agreeing with the types in Vancouver and in Oregon. In the specimens before me, the marginal border of the secondaries is very much narrower than that of the primaries, and on neither wing is it divided by the nervures.

Closely allied to this and the previous species, is a form which I can but separate from them under the name of

C. Harfordii. Hy. Edw. n. sp.?

Bright lemon yellow. Primaries with the border moderate in width, equal throughout its entire length, and more or less serrate on its inner edge. The band is divided by the nervures, but as in *Chrysomelas*, never to its extreme edge. The discal spot is oblong, yellow, surrounded by black. Secondaries with the marginal border narrower than in the primaries, and ending somewhat abruptly before reaching the submedian nervure. Beneath, the wings are uniformly pale orange, a little palest on the internal margin of the primaries, and devoid of the black or grayish scales so apparent in *Occidentalis* and *Chrysomelas*. Discal spot of primaries same as upper side. That of secondaries is clear white, surrounded by a brownish pink ring, and there is a faint indication of a row of submarginal spots of the same color on both wings. Fringes, costal edges, antennæ, and feet, rose pink. Expanse wings, 1.75 in., 1.90 inch.

From seven males, (Coll. Hy. Edw.) Contra Costa Co. (Hy. Edw.). Havi-lab, Kern Co. (R. H. Stretch).

I have named this species in compliment to Mr. W. G. W. Harford, the earnest and talented curator of the California Academy of Sciences, who has added many treasures to my collection.

This is the species formerly sent by me to Mr. W. H. Edwards, as the lemon colored variety of *Keewaydin*, and figured by him as such in the first series of "Butterflies of N. America." I am now fully convinced that it is not a variety of *Keewaydin*, though it may be an extreme and small form of either *Chrysomelas* or *Occidentalis*, a fact which cannot be proved until the female is known to us,

C. Interior. Scud.

The female of this distinct species is unknown to me, but a beautiful male, exactly agreeing in all respects with Mr. Scudder's original type (at present in my possession), was taken by Mr. James Behrens, at Soda Springs, Siskiyou Co., in June, 1874; and another splendid specimen was found by the late Mr. Crotch at Lahache, British Columbia. The border is much narrower than in any other species of this group.

C. Scudderi. Reakirt.

Principally confined to the Rocky Mountains, though an albino female, undoubtedly belonging to this species was taken by Mr. Crotch in British Columbia. *Scudderi* is distinguished by its broad pink fringes, and the almost immaculate females, as well as by the uniform greenish yellow of the lower side.

C. Alexandra. Edw.

A most strongly marked and characteristic species, which cannot, I think, be confounded with any other, and to which the following may, perhaps, be referred. It is abundant in some portions of Colorado, and was taken by Mr. T. L. Mead in considerable numbers. Albino females are by no means rare.

C. Edwardsii. Behr.

I am inclined to think this a mere variation of the preceding, as beyond the fact that the marginal border of the male is a little narrower and slightly more serrate on its inner edge, I can perceive no difference. The females are exactly alike in every particular. *Edwardsii* is not rare in the early summer near Virginia City, but it flies rapidly, and is very difficult to capture.

C. Emilia. W. H. Edw.

Described from a single male in the collection of Dr. Behr, and received by him from Oregon. The wings are remarkably angular about the middle, and the marginal border follows the shape of the wing. In other respects it resembles *Interior*, and may be a form of that species.

GROUP IV.

C. Pelidne. Bois.=*C. Labradorensis.* Scud.

Evidently a common insect in Labrador and British America. I have received specimens from near Sitka, Alaska, and have seen others from the mouth of the Yukon River. Mr. Scudder's "pallid female" of *Laurentina* is remarkably like this species.

C. Palæno. Linn.

Specimens exactly agreeing with European material, are in my collection and that of Mr. J. Behrens, from Alaska, captured by the late Mr. Bischoff. The whole of the examples (four) are females.

C. Chippewa. Edw.=*C. Helena*. Edw.

Professor Zeller is of opinion that the present species is but a form of *Palæno*, and with the fact before us that the typical *Palæno* is found in Alaska, it is more than probable that he is correct in his supposition.

GROUP V.

C. Behrii. Edw.

This very characteristic and distinct species, which has been rightly named in honor of Dr. Behr, the pioneer of Californian entomology, is found only about the rim of the great Yosemite basin, and usually at an altitude of from 8,000 to 12,000 feet. In these unfrequented spots it flies sparingly, and is, of course, difficult to capture, from the rugged nature of its haunts. It seems chiefly to settle on the flowers of a species of *Eriogonum*. Nothing is known of its early stages, and at present it is remarkably rare in collections.

C. Nastes. Bdv.

Nothing resembling this exquisite little species has yet been found on the Pacific side of the continent, though it will probably turn up in Alaska or British Columbia, when those very rich regions are properly explored.

LIST OF SPECIES AND VARIETIES NOTICED IN THIS PAPER.

<i>Colias Meadii</i> , W. H. Edw.....	Colorado.
" <i>Eurytheme</i> , Bois.....	Pacific and Atlantic States.
" <i>Keewaydin</i> , W. H. Edw.....	Pacific and Atlantic States.
" <i>Ariadne</i> , W. H. Edw.....	California and Oregon.
" <i>Hecla</i> , Lef.....	Greenland.
" <i>Christina</i> , W. H. Edw.....	Great Slave Lake.
" <i>Philodice</i> , Godt.....	Atlantic States.
" <i>Anthyale</i> , Hubn.....	Atlantic States.
" <i>Eriphyle</i> , W. H. Edw.....	British Columbia
" <i>Astræa</i> , W. H. Edw.....	Montana.
" <i>Laurentina</i> , Scud.....	Cape Breton Island.
" <i>Barbara</i> , Hy. Edw.....	California.
" <i>Chrysomelas</i> , H. Edw.....	Napa County, California.
" <i>Occidentalis</i> , Scud.....	British America, Vancouver Island.
" <i>Harfordii</i> , Hy. Edw.....	California.
" <i>Interior</i> , Scud.....	British America, Oregon, etc.
" <i>Scudleri</i> , Reakirt.....	Colorado, British Columbia.
" <i>Alexandra</i> , W. H. Edw.....	Colorado.
" <i>Edwardsii</i> , Behr.....	Nevada.
" <i>Emilia</i> , W. H. Edw.....	Oregon.
" <i>Pelidne</i> , Bois.....	Labrador.
" <i>Palæno</i> , Lemi.....	Alaska.
" <i>Chippewa</i> , W. H. Edw.....	Mackenzie's River.
" <i>Behrii</i> , W. H. Edw.....	Sierra Nevada, Cal.
" <i>Nastes</i> , Bdv.....	Labrador.

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[From the Proceedings of the California Academy of Sciences, March 5, 1877.]

**Pacific Coast Lepidoptera.—No. 25. Description of a New
Species of *Plusia* from Arizona.**

BY HENRY EDWARDS.

Among some beautiful *Heterocera* recently received from near Prescott, Arizona, I find a specimen of the grandest *Plusia* I have ever yet seen, which is far more brilliant than *P. Chrysilis* or *P. Orichalcea* of Europe, or *P. Æmula* of India. Indeed, the present species may be regarded as the emperor of the genus, as far as its beauty is concerned, and one of the most interesting moths yet forwarded from the little-known region in which it has made its home.

Plusia Howardi. Hy. Edw. n. sp.

Thorax and abdomen rich purplish brown, with the thoracic tufts slightly darker than the remainder. The ground color of the primaries is rich brown, but this color is confined to a sub-triangular basal patch, and a triangular space in the middle of the wing reaching to the costa, and enclosing the reniform and sub-reniform. The rest of the surface is a very rich shining metallic gold, in the form of a crescent, commencing on costa, thence extending to the internal margin, and spreading upward to the apex. This mark is about three lines broad, and of nearly equal width throughout. There is also a round gold spot at the base, two-thirds of the wing being occupied by this brilliant metallic tint. Fringes, golden brown. Secondaries, as well as the whole of the lower side, fawn drab, a little darker on the nervures and towards the margins. Expanse wings, 1.35 inch.

One male. Taken at Prescott, Arizona, by Mr. Winslow Howard, to whom I have much pleasure in dedicating this superb species.

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[From the proceedings of the California Academy of Sciences, December 17, 1877.]

**Pacific Coast Lepidoptera, No. 26. Description of two
New Forms of Diurnals.**

BY HENRY EDWARDS.

The late Mr. G. R. Crotch, during his travels in British Columbia, captured several examples of an *Argynnis*, which is so distinctive in its characters, as to be entitled to a name, though it may ultimately prove to be a variety of the well known *A. Atlantis* of the Atlantic States. Mr. W. H. Edwards is however of opinion that it is a distinct species, and guided by his judgment, I venture to describe it as

Argynnis Columbia, n. sp.

Somewhat smaller than *Atlantis*, with the fore wings shorter and more rounded at the apices—decidedly paler in the color of the upper surface, and wanting the suffused blackish shade at the base, which is usual in *Atlantis*. The spots are smaller and less confluent, and the marginal border less distinct and narrower than in that species. The spots and band are also very decidedly cut by the nervules, and do not blend as in *Atlantis*, giving a brighter and livelier appearance to the surface.

Under side. Marked as in *Atlantis*, but with the silver spots smaller, and the black margin which edges them above, more distinct. The marginal lunules are less sharply triangular, and the ochreous band, between the two outer rows of spots, paler and broader than in the allied species.

Exp. of wings, 1.75—2.00 inch ♂.

The ♀ is not in my possession, the above description being made from four ♂♂ taken by Mr. Crotch, at Lahache, near the Alaskan border of British Columbia.

A very remarkable form of *Lycæna* was taken in July, 1876, at Tehachapi Pass, S. P. R. R., Kern Co., by Mr. R. H. Stretch. I offer a description of it, as

Lycæna Clara, n. sp.

Allied to *Lyc. Heteronea*, Bdv. Upper surface, dull slate blue, shading into mouse color at the margins, with a sinuous submarginal row of small black spots, and two rather large discal spots on primaries, and on the secondaries also a sinuous row of spots, with the discal pair very distinct. There is no appearance of the fulvous tint, common to *L. Heteronea*. Under side.—Ash grey, with the spots of the primaries very distinct, and those of the secondaries much more strongly marked than in *Lyc. Heteronea*.

Exp. of wings, 1.15 inch.

Described from six ♀♀ taken in the above locality. If a var. of the ♀ of *L. Heteronea*, it is remarkably constant in its characters, and differs exceedingly by the entire absence of any shade of fulvous, which appears on the upper surface of all my examples of that species; taken both in Colorado and the mountains of California.

[From the Proceedings of the California Academy of Sciences, June 17, 1878.]

**Pacific Coast Lepidoptera, No. 27. Transformations of
some Species not hitherto recorded.**

BY HENRY EDWARDS.

Fam. Lycaenidae.

Thecla irioides. Bois.

Larva, full grown. Carmine red, covered with very short hair, each segment involute above, with deep, double foveæ.

Length, 0.50 inch. Two specimens taken near Summit Station, Sierra Nevada, by Mrs. Hy. Edwards, July 12, 1877. They were crawling upon bare granite rocks, near patches of *Sedum spathulifolium*. Hook. Changed to *Chrysalis* July 15th and 17th.

Chrysalis. Pitchy brown, covered with very short bristly hair, swollen about the abdomen, and much narrowed toward the head. Spiracles tuberculate. Wing cases paler.

Length, 0.40 inch.

Imago appeared March 15, 1878.

Fam. Lithosidae.

Cisthene nexa. Stretch.

Egg. Pure clear white, very shining; spherical above, attached by a somewhat flattened base.

Larva, full grown. Ground color, sordid yellow. Head rather large, with three series of blackish brown dots, and a subtriangular mark in front. Whole body very irregularly marked with greenish black undulate streaks. Each segment is furnished with a series of long hairs, those of the dorsal region black, of the lateral, white. Feet and legs black.

Length, 0.60 inch. Feeding on various species of lichens on palings and bark of trees. Changed to *Chrysalis*, March 12.

Chrysalis. Blackish brown, paler at the segments; about 0.40 inch in length; enclosed in very thin and delicate web, which is spread out considerably over the place of attachment. The perfect insect appeared on the 30th of May.

Fam. Bombycidae.

Saturnia Mendocino. Grote.

I am indebted to my friend, Mr. Oscar Baron, of Mendocino Co., for an opportunity of observing the earlier stages of this beautiful and extremely rare species.

Egg. Ovate. Very smooth and shining, deposited in masses of five or six; flattened at the place of attachment. Cream color, marbled with reddish brown.

The young larvæ are blackish on their exclusion from the egg, and continue so until after the

2d MOULT, when they are yellowish white, with the exception of the 4th and 11th segments, and a lateral line above the spiracles, deep velvety black. The spinose tubercles are bright vermillion red, bearing black hairs, and in the interspaces are numerous hairs of pure white. Feet and lower side pitchy black.

3d MOULT. Similar to the last, but a deeper yellow, with the lateral band wider and of a deeper black, and the red spinose tubercles larger and more distinct.

4th MOULT. The ground color now becomes bright apple-green—the black lateral line is wholly lost, and the bands of the 4th and 11th segments reduced to central spots.

5th MOULT. Like the last, with the central spots almost obsolete. There is no further change until the caterpillar is

Full grown. Head small, rough, purplish brown, somewhat withdrawn into the second segment. Ground color of body, pale yellowish green. On the second and anal segments are four tubercles each, bright orange red, with black hairs springing from them, and on each of the other segments are six similar tubercles, those of the anterior four being the largest. Head and body thickly clothed with whitish hair. Laterally there is a pale yellowish fold above the spiracles, which are orange with a darker ring. Feet and underside purplish brown. Length, 2.25 inch. Food plant, *Arctostaphylos tomentosa*.

Cocoon. Inner layers very fine and smooth in their texture, the outer ones very coarse and much honeycombed; web, dull brown, attached to the stem of food plant.

Chrysalis. Short, light brown, with the segments roughened. Head and antennal cases paler, the former very distinctly seen through its case.

Length, 1.00 inch.

The perfect insect emerges in May and June.

Fam. Noctuidæ.

Acronycta spini. Grote.

Egg. Pale straw color, when freshly deposited, but in a few days changing to dull lilac, with darker spots. The eggs are placed in large masses, the ♀ observed by me laying over 200, all cemented together, the edges of one overlapping the other, but so disposed that each egg partially touches the substance on which they are laid. In shape, they are a conic sphere, the base being spread out extremely, semi-transparent at the edges, and very glossy beneath. The sides of the cone are deeply but irregularly striated to the apex, the striæ forming channels in the surface, and being partly waved in outline. Among the masses of eggs, are some few spiculæ of various lengths, placed without regard to regularity. April 14, 1877. Emerged April 30.

Young larva. Black, with the spaces between the segments somewhat yellowish. Head, dense jet black, shining, moderately large. Hairs very long, black. Under side, dirty yellowish black. In consequence of my sudden absence from home, the young larvæ were neglected and died, so that as yet I know nothing of the future stages of this species.

Zotheca tranquilla. Grote.

Head, moderate, black, shining, paler in front and about the mouth parts: dorsal region wholly dull black, with a broken median stripe, composed of alternate cordate and oblong bright lemon-yellow patches. These are occasionally divided by a black line, and are arranged, two to each segment. There is a sub-dorsal whitish line, and below this is a lateral space of greenish slate color, slightly blotched with black. Lateral region, bright yellow, with a few black spots. Spiracles, black. There are a few white hairs in each segment, and occasionally, though only in a few individuals, the whole of the dorsal space becomes dull greenish slate, the markings being still preserved. Beneath, greenish slate color. Feet, jet black. Abdominal legs, greenish slate, dotted with black. Length, 1.15 inch.

On *Sambucus glauca*. Nutt. Kern Co. R. H. Stretch. May, 1876. Moth emerged in July.

[From the proceedings of the California Academy of Sciences, June 17, 1878.]

Pacific Coast Lepidoptera, No. 28. On the occurrence of some Rare Species of Diurnals in California.

BY HENRY EDWARDS.

During the past year some very rare Diurnal Lepidoptera have been taken in considerable numbers within the borders of our State, and for the sake of the entomologists at a distance, to whom the species referred to are as yet known only through the medium of descriptions, I have thought it profitable to state the facts with reference to their capture. And in so doing, I desire to pay my tribute of respect to the memory of a young and earnest naturalist, who united in his brief life the enthusiasm of the student with the profound observation of the practiced man of science. I allude to Herman Dwinelle, the son of our old and esteemed resident, Jno. W. Dwinelle. Mr. Dwinelle was a distinguished graduate of our State University, and the kindred sciences of Botany and Entomology won his admiration and his love. Had he lived, he would certainly have made his mark upon the Natural History of this State, and have left behind him a proud and honored name. But he was called suddenly away, just as he attained his majority, and it is only left for us to regret that so much promise should have been thus early crushed. In November last Mr. Dwinelle yielded up his young life, the closing years of which had been devoted to his favorite pursuits. It was my melancholy pleasure to receive, at his own request, the insects which he had collected, and an examination of them suggested the present paper.

Papilio Indra. Reakirt.

Twelve specimens of this very rare *Papilio* were taken by Mr. H. Dwinelle at the fishing station, McCloud River, Shasta Co., in June, 1877. They were all somewhat worn, and it may therefore be concluded that in ordinary seasons May will be the month of their appearance. The species appears to be remarkably constant, and the short tail is one of its strong characteristics, thus differing exceedingly from *P. Pergamus*, Hy. Edw., in which the tails are unusually long.

Anthocaris Hyantis. W. H. Edw.

In a previous paper I have stated that I believed this to be identical with *A. creusa*, Dby., but the examination of a large number of examples has induced me to change my opinion. I have received the typical *A. creusa* from Colorado and Arizona, and find that the discal spot is always much larger and broader than the same mark in *A. Hyantis*, the apical cloud more strongly defined, and the green marbled surface of the underside of secondaries, very much darker and more extended over the surface of the wing. In *A. creusa* this coloration wants the yellow scales observable in *A. Hyantis*. They may, however, be only forms of one species.

Two specimens, McCloud River, H. Dwinelle; two in Knight's Valley,

Sonoma County, Hy. Edw.; five in Yosemite Valley, T. L. Mead. The last named gentleman writes me that he has also discovered the caterpillar of this hitherto rare species.

Anthocaris Cethura, Feld. = *A. Cooperi*, Behr.

Two ♂ one ♀, taken at San Diego, March, 1877, by Mr. H. Dwinelle.

Midea lanceolata. Bois.

Apparently abundant in certain seasons in the Coast range of mountains, flying in company with *Pieris castoria*, Reakt., and *P. sisymbrii*, Bdv., with which it may easily be confounded while on the wing. It is at present quite rare in collections.

Colias Barbara. Hy. Edw.

A ♀ of this very distinct and interesting species was taken by Mr. T. L. Mead at Santa Barbara in May last, exactly agreeing with the type. I am inclined to think that this is the ♀ of *C. Harfordii*, Hy. Edw.

Polyommattus cupreus. Bdv.

A fine ♂ added to my collection by Mr. H. Dwinelle, from the McCloud River, Shasta County.

Lycæna regia. Bdv.

This exquisite species is said by Mr. R. H. Stretch to be extremely abundant near Havilah, Kern Co., in March and April, hovering about species of *Eriogonum*.

[From the proceedings of the California Academy of Sciences, July 1, 1878.]

**Pacific Coast Lepidoptera, No. 29. Description of some
New Genera and Species of Noctuidæ.**

BY HENRY EDWARDS.

I have the pleasure to present the following descriptions of what appear to me to be new forms of a very interesting group of insects, most of which were supplied to me by my friend, Mr. R. H. Stretch, whose kindness I have very frequently acknowledged in these papers.

Xanthothrix, n. genus.

Antennæ scaled, simple in both sexes. Head small, and almost concealed by the thorax, the palpi being very short, when compared with those of *Heliolonche*, to which genus the present bears a superficial resemblance. Wings shaped as in *Melicleptria*. Body only slightly clothed with hair. Thorax rather broad, its vestiture being almost erect. All the tibiæ spined. Ovipositor of ♀ small, exserted.

This genus appears to be closely related to *Melicleptria*, at the same time possessing much of the appearance, and all the habit of *Heliolonche*; the latter genus, like the present, being frequently found at rest in flowers. The coloration of *Xanthothrix* is very peculiar as regards its group.

Xanthothrix ramunculi. Hy. Edw., n. sp.

♂ ♀. Primaries wholly rich buff, sometimes pale orange when very fresh, but upon some scales being removed, showing a blackish tint. Secondaries, dusky along the costa, apical margin and at the base, buff in the centre, and towards the anal angle. Abdomen dusky, ringed with buff. Thorax concolorous with the primaries. Beneath, entirely pale buff.

Exp. of wings, 0.85 inch.

Variety. Primaries entirely of an olivaceous tint; the dusky space of the secondaries deeper than in the foregoing. Under side of primaries more or less dusky.

Eleven ♂ eight ♀, taken on flowers of *Ranunculus Californicus*, Benth., at Havilah, Kern Co., by R. H. Stretch, Esq.

Thalpochares Arizonae. Hy. Edw., n. sp.

Closely allied to *T. elegantula*, Harvey, but much smaller. Primaries at base, sordid white. Median band of primaries very narrow and contrary to *T. elegantula*, it is narrowest at the internal margin. The space behind it is sordid buff. Secondaries, clear pearl white, with the fringes a little buff.

Exp. of wings, 0.45 inch.

Prescott, Arizona. Dr. H. Davis. Two specimens, coll. Hy. Edw.

Syneda Hastingsii. Hy. Edw., n. sp.

Somewhat at first sight, resembling *S. Howlandi*, Grote, but the under wings are much more vivid crimson, and the shape of the band is different. The primaries have the ground color darker than in *Howlandi*, with the lines more concolorous, and the pale greyish submarginal shade, so characteristic of *Howlandi*, is here almost wanting. The secondaries are pale, but bright crimson, with the discal spot strong and clearly defined. The submedian band is almost straight on its outer edge, thus resembling the band of *S. Tejonica*. Outwardly it is deeply notched only in the middle, and is broader throughout than in *S. Howlandi*. The marginal band is narrow and slightly waved in the centre. Fringe pure white, except towards the middle, where it is slightly stained by the band. Thorax and abdomen stone color, the former with long blackish scales.

Under side. Primaries, sordid buff at the base; about the middle an oblique black band, united to a submarginal one at the internal angle, and enclosing a buff ovate space. Behind the submarginal band is a buff waved line, margins brown black. Secondaries, yellowish crimson, paler along the costa. Discal spot and bands as on the upper side.

Exp. of wings, 1.20 inch. One ♂ Coll. Hy. Edw.

Taken at the Dalles, Oregon, by Mr. E. W. Willis, and dedicated by me to Judge S. C. Hastings of San Francisco, to whose earnest labors science is chiefly indebted for the publication of the "Botany of California."

Syneda mirifica. Hy. Edw., n. sp.

Ground color of primaries fawn color, with all the lines very distinct in their outline, and edged with whitish, thus giving a lighter appearance than in any species known to me. About the base are some faint black streaks. The t. a. is oblique inwardly from the costa, turning rather suddenly as it approaches the internal margin; t. p. is almost straight; median space fawn color, darker posteriorly. The sub-marginal line is slightly waved; between it and the t. p. is a darker space, resting on which is the usual toothed spot, which is pure white anteriorly. The space behind sub-marginal line is pale greyish and the apex is white. Fringes greyish, mottled with brown. Secondaries, pale buff, towards the base outwardly shading into yellowish crimson. Discal spot long and almost uniting with the sub-marginal band, which is narrower, deeply toothed in the middle, and united to the marginal line by a large sub-ovate blotch. A very fine black line connects this blotch with another of the same form at the anal angle, the color of the last being carried into the otherwise pure white fringe.

Under side. Yellowish white, with usual bands and marks well defined. The oblique median band of primaries is, however, reduced to a cloud, and the sub-marginal band of secondaries distinctly divided in the middle.

Exp. of wings, 1.40 inch.

One ♂ one ♀. Virginia City, Nev. Hy. Edw. A very distinct and well marked species, and apparently quite rare.

Synedoida. n. g.

Structurally like *Syneda*, but differing remarkably in its system of coloration. The lower wings are destitute of the waved bands so characteristic of *Syneda*, and the prevailing color of the species is ochreous drab, or stone color. In fact, these are the only differences which present themselves, and it may therefore be more proper to consider the two species hereafter described as forming only a sub-genus of *Syneda*.

Synedoida biformata. n. sp.

Ground color of primaries, pale brown, with the lines somewhat broadly bordered with black. The t. a. is oblique, deeply notched in the centre, while the t. p. is very irregular in its outline, commencing on the costa within two lines of the apex, and enclosing the usual pale blotch so well-known in *Syneda*. This line is slightly notched on its upper half, thence it passes transversely to the centre of the wing, forming a deep angular space, exactly opposite the central notch of the t. a., thence widening out slightly to the interior margin, which it reaches about $1\frac{1}{2}$ line from the interior angle. Median interspace pale fawn color, with darker central blotch. Secondaries, pale salmon color, with a few dark brown submarginal scales. Head and thorax ochreous drab.

Under side. Pale salmon or buff, with faint indications of the markings of the upper surface.

Exp. of wings, 1.50 inch. Two ♂. Coll. Hy. Edw.

Havilah, Kern Co. Mr. R. H. Stretch.

Synedoida scrupulosa. Hy. Edw. n. sp.

Primaries, pale greyish drab, with the markings brown, in some specimens inclining to chestnut. T. a. waved so as to form three indentations. T. p. irregular, as in the preceding species, but with the angles less acute, and slightly curved anteriorly as it reaches the interior margin. The basal part of the median interspace is pale grey, and from this point to the margin, the wing is darker in color, with a small black clouded spot near the apex. The thorax and abdomen are whitish grey, dotted, as are the paler portions of the band, with black scales. Secondaries, sordid white, with faint indications of a marginal band, and a waved sub-marginal line.

Under side. Sordid white, clouded toward the apex and margins; discal spot of primaries very distinct, the secondaries thickly dotted with black scales.

Exp. of wings, 1.50 inch. Three ♂ two ♀. Coll. Hy. Edw.

Havilah, Kern Co. Mr. R. H. Stretch.

These interesting insects have the habit of *Syneda*, flying very rapidly when disturbed, and alighting among stones and dried herbage resembling them in color. *S. scrupulosa* is said by Mr. Stretch, to make its home in the gravelly beds of creeks, its color rendering it almost impossible to be discovered when at rest.

Cirrhobolina tetrica. Hy. Edw. n. sp.

Primaries olive brown, with the apex very acute, lines and markings indistinct, in this respect much resembling *C. incandescens*, Grote. The t. a. is almost obsolete, and the t. p. consists of a faint waved black line commencing at the costa near the apex, and reaching the internal margin at nearly its half. There are a few dark oblique streaks on the costa directed posteriorly. Extreme margin and fringe pale stone color. Secondaries, sordid buff, with clouded discal spot. A broad band crosses the center of the wing nearer to its middle than in the Texan species. This band is broadest at the apical angle. Behind this is a band of dull buff, not connected with the median band.

Under side. Primaries, sordid buff, with oblique median band, connecting with a broad marginal one, near the interior angle. Secondaries, nearly as above, but with the band and marks more clouded and indistinct.

Exp. of wings, 1.50 inch. One ♂. Coll. Hy. Edw., from chrysalis at base of oaks, Sacramento, Cal. One ♂; one ♀; Coll. Dr. H. Behr.

SPECIES DESCRIBED IN THIS PAPER.

Xanthothrix ranunculi.

Synedoida biformata.

Thalpochares Arizonae.

Synedoida scrupulosa.

Syneda Hastingsii.

Cirrhobolina tetrica.

Syneda mirifica.

[From the proceedings of the California Academy of Science, July 15, 1878.]

Pacific Coast Lepidoptera, No. 30. Notes on the Genus *Parnassius*.

BY HENRY EDWARDS.

An extreme interest in this beautiful genus of butterflies has always existed in the minds of entomologists, and the few facts which I have been enabled to bring together as regards its geographical range, and especially with reference to its distribution over the North American continent, may probably be of some value to observers. The genus is clearly an Asiatic one, and most probably had its origin somewhere in Siberia, where the greater number of species are still to be found. Thence, it appears to have spread eastwardly to Kamtchatka, crossing Behrings Straits to Russian America, thus affording additional proof of the connection of the two continents during a comparatively recent geological period; passing through Alaska down the Rocky Mountain chain, as far south as the 32nd degree of N. Latitude, beyond which it has not been discovered. Its eastern North American limit is in the Coloradan portion of the Rocky Mountains, in about 105° W. Longitude, these boundaries being remarkably well defined, the genus under consideration seeming to have stopped suddenly in its migrations in all the directions in which it has traveled. Westwardly from Siberia it has passed through Russia into the northern countries of Europe, as far north as Lapland, and south to the mountains of Switzerland in about 46 N. Latitude, this being on that continent its southern limit. In Asia it travels southward to the Himalayan chain, some species being found in Thibet and Nepaul, about 28° S. It will therefore be seen that the geographical range in the old world somewhat resembles that of the new, some few specimens having been taken in Arizona and New Mexico in Lat. 32° S., but it is worthy of notice, that east of the Rocky Mountains, even in situations favorable to their existence, no examples have been met with in America, while in Europe, as I have stated, species extend from Lapland in the North West to the extreme eastern limit of Siberia.

Within their circumscribed boundaries, the species of *Parnassius* appear to be rather local than rare, the individuals being found in considerable numbers where favorable circumstances occur. This is especially the case with *P. Apollo* of the Swiss Alps, *P. Smintheus* of the Rocky Mountains, and in a less degree with *P. Clodius* of our own Sierras. There is also another peculiarity in the group, and that is, that, though extremely liable to variation, the varieties themselves are for the most part permanent, and easy of division, giving rise to the idea that they are in the transition state from varieties to species. This is especially remarkable in the form known as *P. Behri*, in which the colored spots are always yellow instead of red, as in the majority of the species. *P. Behri* is now regarded by most entomologists as a variety of *P. Smintheus*, common in the Rocky Mountains; and this again is said to be identical with *P. intermedius* of western Siberia. But it is a remarkable fact that *P. Behri* (always with yellow spots) is found in California, occasion-

ally in large numbers, while no single example of the typical *P. Smintheus* (with red spots) has yet been met with within the borders of this State. It may, therefore, be reasonable to conclude that in the distribution of the species known as *P. Smintheus*, certain individuals, differing from the type, divided themselves from the main body, and passed down the chain of the Sierra into California, here meeting with certain conditions at present only vaguely known to us, which tended to the development of yellow rather than of red spots, at the same time eliminating some of the black patches on the wings of the typical form, and producing the examples which we now recognise under the name of *P. Behri*. The extreme difference between the appearance of this form, and that which we are led to believe to be its original type, is a most striking example of the necessity which exists for caution in forming species out of groups as variable as this is, and is certainly a beautiful illustration of the endeavor manifested by certain forms of insect life, after wandering from the type, to assume for themselves definite and permanent conditions. In fact, the several species of *Parnassius* afford numerous evidences of the truth of the theory of evolution, and perhaps no genus of butterflies can be studied to better advantage by those who seek to learn the true "origin of species."

The North American species of this interesting genus are confined to the Pacific Coast, and are therefore particularly attractive to the student of Californian entomology. No less than eight forms, probably not all permanent species, but certainly well-marked varieties, are to be found west of the Rocky Mountains, and it is quite possible that an earnest and persevering search in Alaska and British Columbia may yet reveal more, as one of these, and the most remarkable of the whole group, was brought to me from the Yukon river, Alaska, by Mr. F. W. Smith, who captured it in June, 1877. These insects appear to prefer either granite or limestone regions, and where they occur, are sometimes found in considerable numbers.

The caterpillars feed upon various species of *Sedum* (stone crop), as well as upon plants of the order *Primulaceæ*. The species are for the most part lovers of alpine regions, and are frequently found as high as the limits of perpetual snow. *P. Behrii* was taken by Mr. J. W. Hutchings, formerly of Yosemite Valley, near the top of Mt. Lyell, at an altitude of nearly 11,000 feet. Our most common species is *P. clodius*, Men., which has a wide range and varies very much in different individuals. The typical form of this species, which has the red spots very large and distinct, and the wings nearly opaque, occurs occasionally nearly at the sea level, having been taken by Mr. J. Behrens at Bodega, about 500 feet above the sea, and more recently in large numbers, as I learn from Dr. Behr, at Tomales, Marin County. As it approaches the mountains, it becomes smaller in size, with the wings more transparent, and the spots smaller. It is now known as *P. Baldur*, Edw. = *P. clarius*, Bdv. nec. Eversm. This form is abundant in some portions of the Sierra Nevada, particularly from Emigrant Gap to the Summit, C. P. R. R. Another form, still more distinct, in which the spots are nearly obliterated, the ♀ closely resembling the ♂ of *P. clodius* (type), I have ventured to describe as *P. Menetriesii*. This is to be taken also at high elevations, my specimens

coming from Lake Tahoe and neighborhood, and one ♀ from the Wasatch Mountains, Utah, where it was captured by Mr. J. D. Putnam. Mr. T. L. Mead took a grand ♀ recently in the Yosemite Valley, and induced her to lay eggs upon a plant of *Sedum*, so that we may soon reasonably hope to know something of the transformations of this exquisite species.

The localities in which *P. clodius* and its varieties are known to occur, are as follows:

P. clodius. Menetr.

Bodega, 500 feet; J. Behrens. Tomales, 500-600 feet; Dr. Behr. McCloud fishing station, 1,000 feet; H. Dwinelle. Nr. Olympia, W. T., 800 feet; Hy. Edwards. Vancouver Island, 350 feet; G. R. Crotch.

P. Baldur. W. H. Edw.

Sierra Nevada, from Emigrant Gap to Summit Station, 4500 to 8000 feet; Hy. Edwards. Lake Tahoe, 6,000 feet; Hy. Edwards. Tamarack Flat, near Yosemite, 6,000 feet; Hy. Edwards. Yosemite Valley, 4,200 feet; T. L. Mead.

P. Menetriesii. Hy. Edw.

Donner Lake, 5,600 feet; Hy. Edwards. Bear Valley, Placer Co., 4,000 feet; Hy. Edwards. Wasatch Mts., Utah; J. D. Putnam.

I have no doubt that these are all forms of one species, subject to certain variations from change of food, temperature and other conditions.

P. Nomion. Fisch.

Common in some parts of Siberia; has been taken in Alaska and once in British Columbia, a specimen from the Cariboo mining district having been seen by myself in a small collection from that region. In this, the red spots are very large, with the white pupil very full and distinct.

P. Eversmanni. Men.

This wonderful species is known only through two specimens, one in the Museum of St. Petersburg, and the other in the cabinet of the Chicago Academy of Science, taken on the Yukon River, Alaska, by Dr. W. H. Dall. It has the wings rich yellow, with the usual crimson spot, and apart from its rarity, is among the most beautiful of butterflies.

P. Behrii. W. H. Edw.

I have before spoken of this exquisite form of *P. Smintheus*, as having been found in the high Sierras by Mr. Hutchings. I had the good fortune in the summer of 1877 to come upon a large colony near Summit Station, C. P. R. R. The insects were flying about the slopes of a mass of bare granite rocks, in the crevices of which some stunted plants of *Sedum* were growing. I captured sixteen ♂♂ and one ♀ in about two hours, all in admirable condition. The spots were as I have said, invariably yellow, and not red as in *P. Smintheus*, nor can I find any notice of the typical *Smintheus* being yet met

with in California. Mr. J. D. Putnam took two ♀ of *Behrii* in Wasatch Mountains, Utah, and it was also found sparingly by Mr. T. L. Mead, in his collecting tour in the Rocky Mountains in 1873.

The species alluded to above as having been forwarded to me by Mr. F. W. Smith, may prove to be new, but I hesitate at present to describe it, preferring to wait for the opinion of better informed entomologists upon the subject. It is very different from any species known to me, and at first sight has somewhat the appearance of a *Thais*. The specimen in my possession is a ♂.

The whole of the above belong to the *P. Apollo* group of the genus. It is somewhat singular that we have no representative of that section in which the red spots are absent, which is represented in northern Russia and Siberia by *P. Stubbendorfi*, Men., and in Japan by *P. glacialis*, Butler.

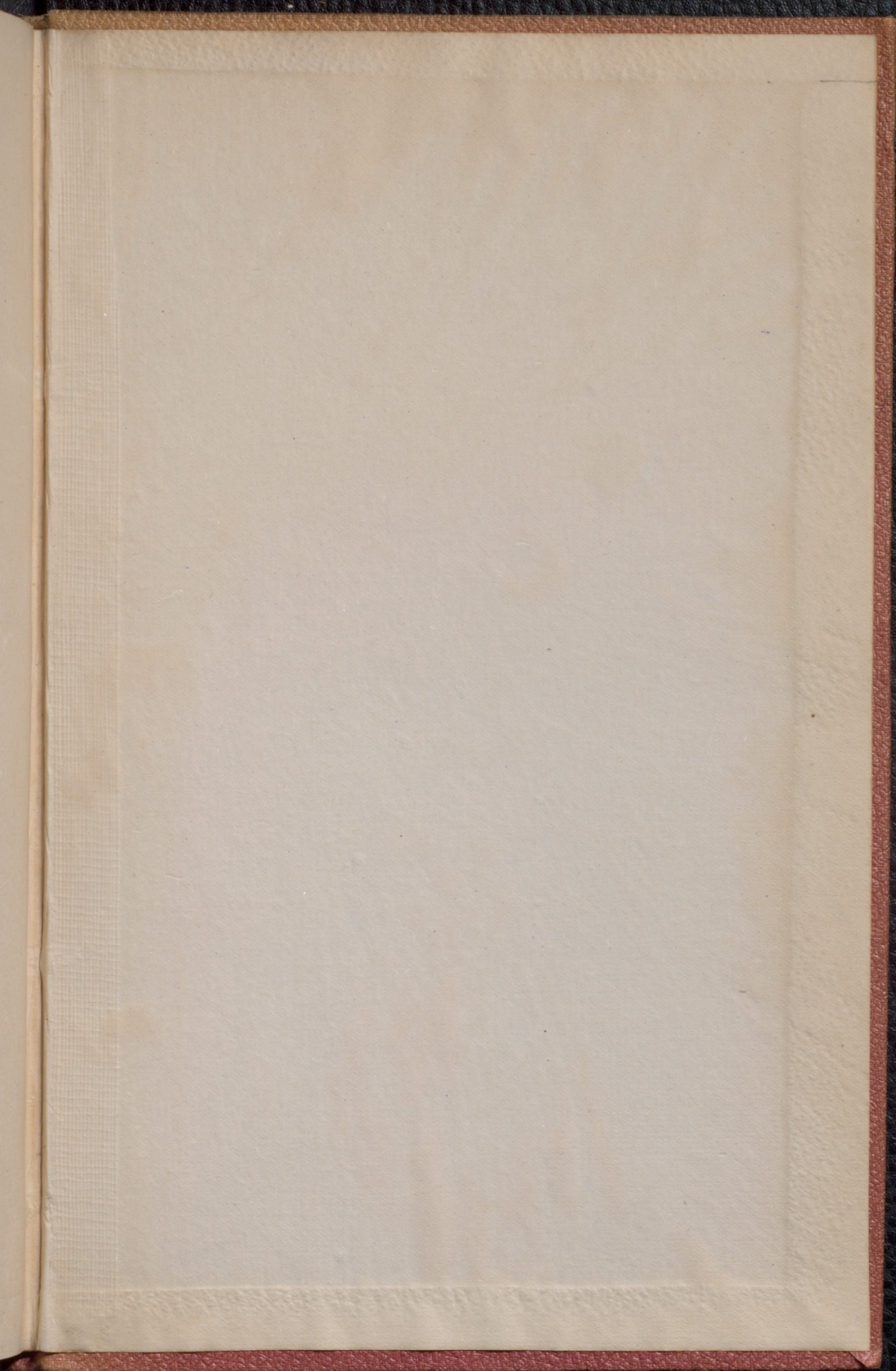
NOTE.—While this paper is passing through the press, I am enabled to record the receipt of a letter from Mr. T. L. Mead, dated "Summit Station, C. P. R. R., July 20, 1878," in which he informs me of the capture of thirteen *P. Behrii*—nine ♂, four ♀—probably in the very same spot in which the species was taken by myself last year. Mr. Mead also expresses the hope that he may be enabled to obtain eggs of this interesting form. H. E.

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